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TOO MANY TELEPHONE TAXES AND TOO MANY OFFICE-HOLDERS

A letter from H. C. Marsh, president and treasurer of the United Telephone Co., at St. Marys, West Va., brings up the important question of taxes, especially telephone taxes.

A bill is pending before the legislative committee on taxation and finance of the West Virginia legislature imposing a $2 tax on every telephone in the state, which the operating company must pay out of its revenues and that without attempting to pass the expense on to the subscribers.

"What do you think of this kind of taxation?" Mr. Marsh asks. "The legislature has already passed a tax of 2¼ per cent on gross sales in the telephone business, and now *This!*"

* * * *

Of course, there is only one answer to Mr. Marsh's indignant question. The proposed tax is oppressively unfair, and undoubtedly was incubated in the brain of a politician who believed it would be a popular move to take a crack at public service corporations, regardless of whether or not they could pay such a charge and continue to give service.

No doubt all telephone interests will oppose this bill (known as House Bill No. 27, introduced by Mr. Belknap) with all the means at their command.

* * * *

Section 1 reads: "All persons, firms, co-partnerships, associations, or corporations engaged in and supplying telephone service to the citizens of West Virginia shall pay a tax of $2 on each telephone in use in this state, connected with any of its lines, or that may hereafter be put in use by any such persons, firms, co-partnerships, associations or corporations; which tax shall be paid semi-annually on the first day of July and January of each year."

* * * *

The wording of the bill might be interpreted to mean that the $2 is to be paid twice a year, or $4 per year. The United company operates approximately 600 stations, which would mean an additional tax of $1,200—or possibly $2,400. No wonder Mr. Marsh sees red!

Furthermore, if each telephone "connected with any of its lines" is to be taxed against each company, it will be seen that there will be plenty of double taxation.

* * * *

The unfairness of the proposed measure sticks out like a sore thumb in the effort to saddle the tax on the company alone. If the state regarded the bill principally as a means of raising needed revenue, it would be indifferent who paid the tax, but the Belknap measure says:

"The tax herein levied to be collected shall be paid by the persons, individuals, co-partnerships, firms, associations or corporations engaged in public service in this state, and shall not be by them, directly or indirectly, charged back to, or passed on to, the consumers, and shall not be construed or considered by the Public Service Commission of West Virginia as grounds for increase in rates."

This is giving orders to the state commission and plain interference with another branch of the government, but that is only a starter. The last section of this telephone tax bill even provides a way out if the courts pronounce the measure unconstitutional. It says:

"If any section, provision, word or clause of this act should be declared invalid, the decision of the court shall not affect or impair any of the remaining provisions of the act. It is hereby declared as a legislative intent that this act would have been adopted and such invalid portion not included herein, and any and all acts or statutes conflicting with the provisions of this act are hereby repealed."

That is telling the courts, as well as the state commission, where they get off! Paraphrasing the motto of the air-mail pilots, "the mail must go through," the Belknap measure decrees that "the telephone tax must stand."

* * * *

This West Virginia exhibit is just an example of the current political rage to harass and persecute companies rendering public service. The millions of citizens who have money invested in utility securities seem to be forgotten by the attackers that are thus raiding their savings.

It is time the investors took a hand in the fight, and defended the utilities against such unreasonable onslaughts. A little thought on their part will convince them

that it is bad enough to have to pay exorbitant taxes, without having their income-producing securities destroyed by reckless treatment of utility companies.

Too Many Office-Holders.

Down in Georgia, where the politicians are making a great uproar over utility rates, Governor Talmadge makes the threat that unless telephone rates are reduced he will order the telephones out of the governor's office and the gubernatorial mansion. This was a grandstand gesture that probably will prove to be a mere bluff.

What peeved the governor was that when his rate commission issued an order to lower rates, the telephone companies filed a petition in court for an injunction to hold up the order, and the chances are good that the court will intervene. As is the case in other states, the political crusade on rates is mainly for the purpose of distracting public attention from the high taxes which office-holders have saddled on the people.

Taking a leaf from the governor's own book, the taxpayers should issue a declaration that they intend to throw out the politicians unless they cut their service rates —meaning the taxes. More and more the American people are beginning to realize that they could get along much better with far fewer office-holders. Government units overlap each other in every direction with the result of piling up taxes to maintain these useless duplications.

According to the statistics, there were last year on the payrolls of state, county, city, township and other local governments, 2,400,000 office-holders who drew in salaries close to four billion dollars. This does not include the national government whose expenses naturally have greatly increased during 1933.

In all England there are but 3,000 public offices. The state of Michigan alone has that number. No wonder taxpayers are asking why Michigan, with a population of 4,400,000, should support as many public office-holders as does England with a population of over 37,000,000. Other states are even worse burdened.

Likewise, why should the people of New York be taxed to support 13,000 local units of government? Also why should the state of Georgia—whose governor threatens to cut out telephone service—owe its public school system $2,500,000 while it maintains hundreds of local government units that should be consolidated in the interest of both efficiency and economy?

* * * *

If the hordes of political parasites that infest every state in the Union could be eliminated, a sigh of relief would come from the over-burdened taxpayers so tremendous as to blow away at least half of the clouds caused by the business depression.

Much of the distress the schools find themselves in, with unpaid teachers and other ills, is caused by the over-supply of local governments. Both in cities and rural sections, school teachers have gone unpaid while the vast army of county officers and job-holders drew salaries for filling unnecessary offices.

The taxpayers should insist on a reorganization of this obsolete system of local governments which, as President Roosevelt says, "was built up in the days of the ox-cart, and in most states is maintained with little change in the days of the automobile."

Political office-holders could take a lesson in economy and efficiency from the utility companies which they are persecuting.

COMING CONVENTIONS

Nebraska Telephone Association, Hotel Paxton, Omaha, February 13 and 14, 1934.

Iowa Independent Telephone Association, Hotel Fort Des Moines, Des Moines, February 21 and 22.

Oklahoma Utilities Association, Hotel Mayo, Tulsa, March 6 and 7.

Electrolysis on Long Toll Cables

Probable Causes of Electrolysis Conditions on St. Louis-Kansas City Underground Toll Cable—Unique Method of Applying Mitigative Measures, and Results—Annual Cost for Protection Small Compared with Cable Investment

By J. B. Blomberg,

Transmission Engineer, Southwestern Bell Telephone Co., Eastern Missouri and Arkansas Area, St. Louis, Mo.

[Editor's Note: Electrolysis of telephone cable has always been a difficulty experienced in telephone plant operation. In recent years the damage to cable sheath from electrolysis has been greatly reduced or practically eliminated by various mitigative measures developed as a result of study of conditions and knowledge of causes.

In the St. Louis-Kansas City toll cable of the Southwestern Bell Telephone Co., new electrolysis conditions were encountered. The method worked out for the mitigation of electrolysis in this long length of cable is described in this article by Mr. Blomberg, who is on the staff of V. P. Ettinger, transmission and protection engineer of the Southwestern Bell Telephone Co. for Eastern Missouri and Arkansas.]

This paper discusses the electrolysis conditions which developed with the construction and completion of the St. Louis-Kansas City underground toll cable owned jointly by the Southwestern Bell Telephone Co. and American Telephone & Telegraph Co. It particularly concerns the portion of the cable in the open country west from St. Charles, Mo., to the suburban limits of Kansas City, and the mitigation of adverse conditions by the application of counter-electromotive force, a method commonly known as raising the earth potentials, or forced drainage.

The application of counter-electromotive force for the mitigation of electrolysis conditions is probably as old as any of the methods in use for combating electrolysis. However, the conditions encountered in this case, and particularly the method and details of remedial application, are probably unique in connection with the protection of long intercity toll cables.

The cable, which is what is termed "full size," consisting of 148 quads of No. 19 B. & S. gauge, 6 pairs of No. 16 gauge, and 1 quad of No. 22 gauge conductors, was laid in vitrified clay conduit placed adjacent to the concrete slab of United States Highway No. 40 for the entire distance between the suburban limits of St. Louis and Kansas City.

The conduit was laid in 1929 and the cable—256 miles in length from terminal to terminal—was installed during 1930, being completed in the late fall of that year.

Manholes were, in general, constructed 750 feet apart except on curves. The loading points are 6,000 feet apart where extra depth or so-called "double deck" manholes were constructed to provide space for the loading pots below the bottom level of the regular manholes.

Iron pipe was used across culverts and at

bridge crossings over creeks and streams, except at the Missouri River crossing at St. Charles, where the cable was suspended on strand wire underneath the bridge deck.

Repeater, or amplifying, stations spaced approximately 50 miles apart are located at Wright City, Kingdom City, Boonville, and Aullville, all of which are terminating points for the cable in each direction. The cable sheath was, however, made continuous by means of bonds at each repeater station.

Electrolysis Conditions.

As the laying and splicing of the cable progressed from St. Louis, rather severe adverse electrolysis conditions developed within the city limits of St. Louis and in St. Louis county between the city limits and the city of St. Charles. These conditions were, of course, due to street railway operation within the city, and in the county to the operation of the paralleling interurban line to St. Charles, and were corrected by drainage at various points.

As construction progressed west of St. Charles, slight positive potential conditions to earth developed along practically the entire route to the suburban limits of Kansas City. These positive conditions ranged in intensity from 0.01 to approximately 0.2 of a volt, which, as was indicated by several surveys, changed to negative at different times along occasional short stretches of the cable.

Measurements of current flow in the sheath indicated a very small amount of current and never in excess of approximately 0.1 of an ampere. The charts of recording meter tests of potential relations to earth showed practically a straight line, and no characteristic evidence whereby the conditions could be traced to street railway or other direct-current operation as the cause.

As a matter of fact, there is no street railway plant in the vicinity of the cable between St. Charles and Kansas City, except the one at Jefferson City and the one at Sedalia, both of which are approximately 40 miles away.

The question as to whether the conditions shown by the tests constituted a definite corrosive hazard requiring mitigative measures was considered from the time of the first tests. Since general experience has indicated that even very small positive potentials to earth will sooner or later result in corrosive damage, it was decided to determine, if possible, the degree of progress of such damage for the short period involved while mitigative measures were being considered.

With this in mind, pilot electrodes in the form of lead sleeves six feet long were installed in a duct adjacent to the cable and bonded to it at various manholes along the cable. Points where the cable was continually positive, and also points where the cable was continually negative, to earth were selected.

Special earth resistivity tests were also made along the route of the cable, using an instrument designed by E. R. Shepard, of the United States Bureau of Standards. It is described in the Bureau of Standards Journal of Research Paper No. 298, under the title, "Pipe Line Currents and Soil Resistivity as Indicators of Local Corrosive Soil Areas."

With this instrument, a number of resistivity measurements were made under comparatively dry surface conditions and later rechecked after heavy rains, with no difference in the results. The general results obtained indicated no particular relations between the earth resistivity and the potential conditions of the cable.

The duct electrodes were pulled out of the ducts for visual inspection three months after installation. Small pits to a depth of approximately 1/32 of an inch were found in some of the duct electrodes. Most of them showed some evidence of being subject to corrosive damage, those situated under drier conditions showing the least evidence of damage.

It is significant that at the point where the greatest damage occurred to the test electrode, this point also showed the lowest earth resistance. This apparently substantiates the theory advanced by the Bureau of Standards paper that low earth resistance is associated with, or rather accelerates, corrosive action.

Since all of the tests so far discussed necessarily had been made at manholes, it was felt that further tests to ascertain actual conditions of the cable in the ducts would be of interest. Tests were accordingly made at various points with a duct-exploring electrode and vacuum-tube voltmeter, and the presence of potentials between the cable and earth of the same magnitude and direction as those at the manholes were established.

After these measurements were made, the cable was excavated in two locations where it was felt corrosion might be found. In one section where cable potential to earth alternated from positive to negative in relatively short distances, 21 feet of cable were exposed for examination. A few very shallow pits were found at the bottom of the cable at this point.

The other location excavated was at the point where the most evidence of corrosion was found on the test electrode and where the duct tests indicated the cable to be positive to earth through the entire section. Fifteen feet of cable were exposed and several corroded spots were found on the bottom of the sheath. The largest of these spots was approximately ¾ths of an inch in diameter, containing several smaller pits to a depth of approximately 1/32nd of an inch.

Evidence of corrosive effects was also found on a number of spare lead sleeves (See Fig. 5), some of which were rather badly pitted. These spare sleeves had been placed at loading points for use when additional loading is installed in order to eliminate the use of split sleeves. Very little, if any, evidence of any corrosive effect was found on the cable itself, even where the worst of the conditions on the sleeves were found.

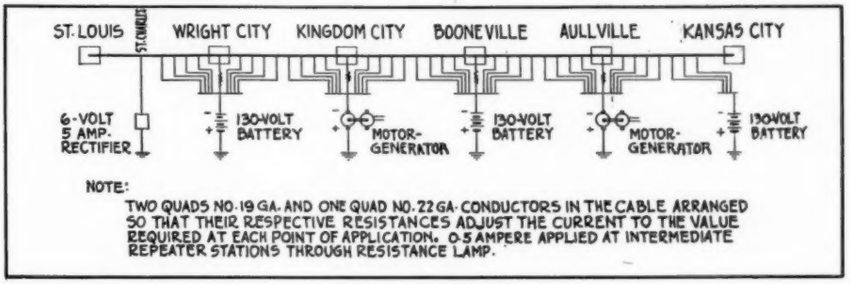

ST. LOUIS
ST. CHARLES
WRIGHT CITY
KINGDOM CITY
BOONEVILLE
AULLVILLE
KANSAS CITY
6-VOLT 5 AMP. RECTIFIER
130-VOLT BATTERY
MOTOR-GENERATOR
130-VOLT BATTERY
MOTOR-GENERATOR
130-VOLT BATTERY
NOTE:
TWO QUADS NO. 19 GA. AND ONE QUAD NO. 22 GA. CONDUCTORS IN THE CABLE ARRANGED SO THAT THEIR RESPECTIVE RESISTANCES ADJUST THE CURRENT TO THE VALUE REQUIRED AT EACH POINT OF APPLICATION. 0.5 AMPERE APPLIED AT INTERMEDIATE REPEATER STATIONS THROUGH RESISTANCE LAMP.

Fig. 1. Schematic Diagram of Electrolysis Mitigation System Applied to St. Louis–Kansas City Underground Toll Cable.

Data for positively determining the origin of the condition discussed are not available but the data already found suggest several possible causes.

A. Earth Currents: Earth currents have been investigated by various scientists and it has been shown that potential gradients and current-flow in the earth vary in magnitude and direction from time to time. In a metallic conductor, such as lead-covered cable laid in earth with various potential gradients, even though it is enclosed in conduit, the resultant current would certainly flow to and from the cable as it passes through earth formations of different electrical conductivity.

B. Current Set Up by Dissimilar Metals: When electrically dissimilar metals are in electrical contact with each other through an electrolyte, galvanic action is set up and current will flow between the metals. This current will cause corrosion of the anode or the metal from which the current enters the solution.

The cable in the present case is supported on iron hangers in all manholes, and each manhole is also equipped with pulling-in irons at each end of the hole, and also an iron ladder. In the case of an iron couple, the lead may be expected to corrode when the electrolyte or water in the manhole is alkaline. Other factors are the iron pipe conduit used over culverts and bridge crossings, and the iron and steel loading pots occurring at regular intervals.

C. Self-Corrosion or Local Actions: The modern theory of corrosion assumes that all corrosive action is basically electrolytic, meaning that it is produced by potentials between adjacent portions of the corroded surface.

Such local cells may be caused by many different conditions, such as inequality of composition—either physical or chemical—of the lead-sheath structure which set up voltage gradients between the surface particles; difference in the composition of the medium, which is in contact with different portions of the lead surface, is also a factor, as is any other combination of conditions that result in a potential difference between adjacent portions of the lead surface.

D. Effect of Variations in Soil: Probably the most important factor in setting up electric current in the sheaths of long, cross-country cables is the effect of electrolytic differences in the soils and ground water conditions through which the cable passes. The sheath may, therefore, be cathodic or negative at some points, and anodic or positive at other points, resulting in a flow of current in the sheath.

Some portions of the cable will be entirely submerged in water, while other portions will pass through the ducts and manholes under more or less dry conditions. From an electrolytic standpoint, the portion of cable that is under water is subject to conditions considerably different from those affecting the portion under drier or entirely dry conditions.

Weather conditions probably exert a great deal of influence on the effect of variations in soil. This influence is probably due to the effect of rainfall upon the solutions which are in contact with the cable sheath.

During the time the St. Louis-Kansas City cable was laid, and for about a year after its completion, the weather conditions were exceedingly dry, with the ground gradually becoming drier and drier to a considerable depth. The cable-to-earth potentials and current flow then obtained were very small, the potentials being nearly all of a positive character.

With return of normal weather conditions and with the ground gradually becoming more moist, conditions changed considerably; more current flowed in the sheath and some of the positive conditions changed to negative.

E. Influence of Repeater Stations: In the cable vault at the repeater stations the cables are supported on metal racks which are bolted to the concrete wall and probably are in contact with the metallic reinforcement in the building walls and, incidentally, with the station ground which is made to the casing of a 200-foot deep well which furnishes the water supply.

Comparative tests showed the racks to have a lower resistance than the cable sheath, which caused the cable to be negative to earth for several miles in each direction, with current flowing toward the repeater stations. That this was a fact was demonstrated by insulating the cable from the racks and determining by tests that the former negative conditions were changed to positive.

Long-Line Currents.

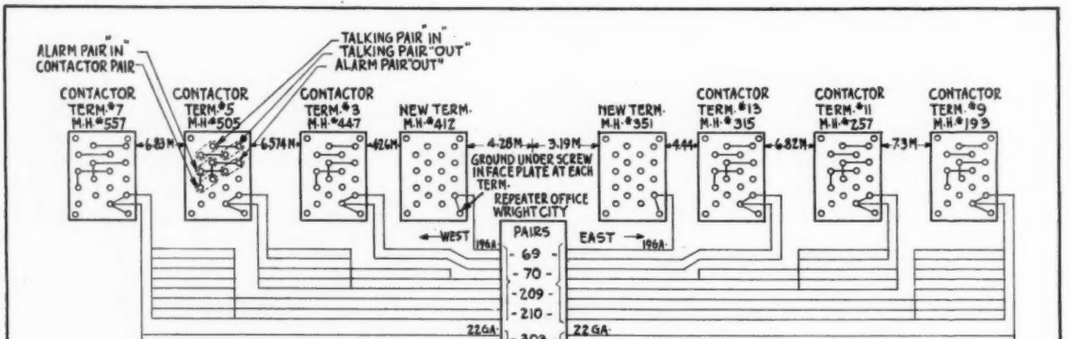
The phenomena of the possible origin of potential conditions and current flow set up in long, intercity toll cables seem to be analogous to conditions and currents involving cross-country pipe lines which have been studied by a number of investigators, among them, notably, K. H. Logan of the United States Bureau of Standards.

In a paper by Mr. Logan, Walter Rogers of the Gulf Pipe Line Co., and J. F. Putnam of the Standard Oil Co., the term "long-line currents" is applied to the conditions under consideration. According to the authors the term is not entirely descriptive, and a definition is somewhat difficult. It does, however, comprise currents, except stray currents from direct-current operations, which may be measured as flowing along any considerable part of long cross-country pipe lines.

It is also stated that one of the most noticeable characteristics of long-line currents is their frequent change in magnitude and direction at different points along the pipe line. The same change is true of the cable, as was determined by the tests using the duct-exploring electrode. In several sections tested, variations in magnitude and reversals in potential direction to earth were very frequent, often occurring a foot or two apart.

In the paper referred to entitled "Test Causes of Pipe Line Current," presented at a meeting of the American Petroleum Institute in December, 1929, Mr. Logan and his co-authors summarized their investigation of pipe-line currents made up to that time as follows:

"From the knowledge of the phenomena



TYPICAL LAYOUT USING 2 QUADS NON-LOADED NO. 19 GA. AND ONE QUAD NO. 22 GA. CONDUCTORS FOR APPLYING NEGATIVE DIRECT CURRENT TO CABLE SHEATH USING 130-VOLTS BATTERY FROM REPEATER STATIONS AS A MEANS OF RAISING EARTH POTENTIALS TO MITIGATE ELECTROLYTIC CORROSION.
THE POINTS OF APPLICATION, DISTANCES WITH COMPUTED AND ACTUAL RESISTANCE AND CURRENT VALUES ARE AS FOLLOWS:—

WRIGHT CITY REPEATER OFFICE

M.H.NO.	DIST.	RESIST.	CURRENT
WEST			
412	4.28	184*178	.64*.71
447	4.26	186*180	.67*.70
505	6.574	200*213	.61*.59
557	6.83	164*171	.74*.74
TOTAL	21.944		2.66*2.74
EAST			
351	3.19	137*135	.85*.92
315	4.44	164*160	.74*.78
257	6.82	192*190	.63*.66
193	7.30	187*175	.71*.72
TOTAL	21.75		2.99*3.08

NOTE: NEW TERMINALS ARE USED AT THE FIRST POINT EAST AND WEST OF WRIGHT CITY ONLY.

KINGDOM CITY REPEATER OFFICE

M.H.NO.	DIST.	RESIST.	CURRENT
WEST			
810	4.55	196*189	.62*.67
832	3.12	165*159	.74*.79
880	6.53	215*196	.56*.64
927	6.59	150*151	.81*.83
TOTAL	20.79		2.73*2.93
EAST			
740	5.24	215*220	.54*.57
714	3.60	190*186	.64*.68
666	6.78	222*221	.55*.58
612	6.87	169*168	.72*.75
TOTAL	22.49		2.45*2.58

NOTE: DISCONNECT FROM C.O. GRD. AND INSULATE CABLE FROM RACKS IN CABLE VAULTS AND APPLY 0.5 AMPERE TO CABLE SHEATH AT EACH OFFICE, EXCEPT AT ST. LOUIS AND KANSAS CITY.

BOONEVILLE REPEATER OFFICE

M.H.NO.	DIST.	RESIST.	CURRENT
WEST			
1154	4.14	176*174	.68*.71
1173	2.70	147*144	.83*.85
1216	5.58	177*179	.69*.69
1280	9.08	150*159	.81*.76
TOTAL	21.50		3.01*3.03
EAST			
1090	4.76	205*202	.60*.62
1067	3.26	172*170	.71*.73
1019	6.38	204*204	.60*.61
972	6.42	156*160	.78*.78
TOTAL	20.82		2.69*2.74

AULLVILLE REPEATER OFFICE

M.H.NO.	DIST.	RESIST.	CURRENT
WEST			
1537	4.93	*212	*.61
1585	6.27	*241	*.54
1649	8.5	*269	*.48
1690	5.5	*198	*.66
TOTAL	25.20		*2.79
EAST			
1470	4.3	*185	*.70
1450	5.64	*214	*.61
1387	5.88	*224	*.58
1344	6.3	*170	*.76
TOTAL	22.12		*2.65

NOTE: INSTALLATION STARTED 4/20/32. COMPLETED AND CURRENT APPLIED 5/18/32.
* ACTUAL RESISTANCE AND CURRENT VALUES.

KANSAS CITY REPEATER OFFICE

M.H.NO.	DIST.	RESIST.	CURR'T.
WEST			
EAST			
1832	9.54	*205	*.59
1790	5.43	*183	*.67
1732	7.9	*169	*.72
TOTAL	22.87		*1.98

Fig. 2. Typical Layout of Electrolysis Mitigation System for Applying Negative Direct Current to Cable Sheath at Repeater Stations as a Means of Raising Earth Potentials.

of pipe-line currents that we now possess, we must conclude either that the cause of the currents is unknown or that they arise from several causes and that the currents found on any may be the resultant or summation of currents from several sources."

In the writer's opinion, the latter is probably the most plausible conclusion, excluding, of course, stray currents from electric railways or other direct-current operations which constitute a separate class. In other words, long-line currents may be classified as not being due to current leakage from any definite external source.

Long-Line Currents and Corrosion.

From a practical standpoint, the reason for studying these long-line currents lies in their possible relation with corrosive effects. Again quoting Mr. Logan's paper, he states that in some instances there appears to be a rather close relation between discharge of current and corrosion, while other cases have been found where no such relation was apparent.

The latter may be explained by assuming that not all corrosion is accompanied by a flow of current over sufficient distances to permit its measurement by the methods employed, and that where discharge of current was found without corrosion, either the discharge had not continued long enough to produce noticeable corrosion or the corrosion may have existed unobserved.

Reduction of the current will, however, reduce the corrosion associated with or caused by the current. In the case of pipe-line currents, Mr. Logan states, in substance, that their importance with respect to their corrosive effect has not been determined with sufficient definiteness to justify any considerable expense in their elimination, but insofar as they can be reduced without appreciable expense, elimination seems advisable.

The means of reducing the currents are two: Reduction of the conductivity by the use of high resistance metal and insulating joints; or surface insulation of the line by non-conducting protective coats.

Mitigative Measures.

The questions as to the necessity for the application of protective measures to the cable under the conditions as discussed, and the methods and means of such protection, were rather perplexing.

The possibility of corrosive effect on the cable is based on the fact that it will occur on portions from which current is discharged and that there is little or no tendency for it to occur on portions which are picking up current from the ground.

As previously stated, the current flowing in the cable sheath never was found to exceed 0.1 ampere and such a small current, if uniformly discharged over any appreciable length of cable, can hardly be expected to produce corrosion enough to cause service failures.

However, evidence obtained where cable has been subject to stray-current conditions, shows that the corrosive action is either of uniform appearance involving large areas, or of a pitting nature confined to comparatively small and scattered areas. The latter is, of course, the more dangerous since it produces perforation of the sheath in shorter time. Sections of cable removed on account of service failure most generally show the latter characteristics.

As already mentioned, excavations were made at two places for the purpose of examining the cable within the ducts. At one of these locations definite positive potentials to earth existed throughout the section, while at the other location the potentials were smaller, with frequent and abrupt reversals.

Evidence of corrosive action was found at both places, the first showing considerably more damage than the other, which is to be expected under the conditions discussed.

Considering this evidence and the effects produced during three months on the test electrodes inserted in adjacent ducts, and with 225 miles of cable, representing a large investment, all subject to questionable potential conditions, and the many varying and generally unknown factors involving soil and moisture conditions, it seemed very optimistic not to apply mitigative measures.

This appeared particularly so in view of the large amount of risk involved and the inconsistency with preventive maintenance practices.

Obviously the method of reducing the current flow in the sheaths, suggested in connection with cross-country pipe lines—by means of insulation joints or the application of surface insulation by protective coatings—was impractical and could not be used.

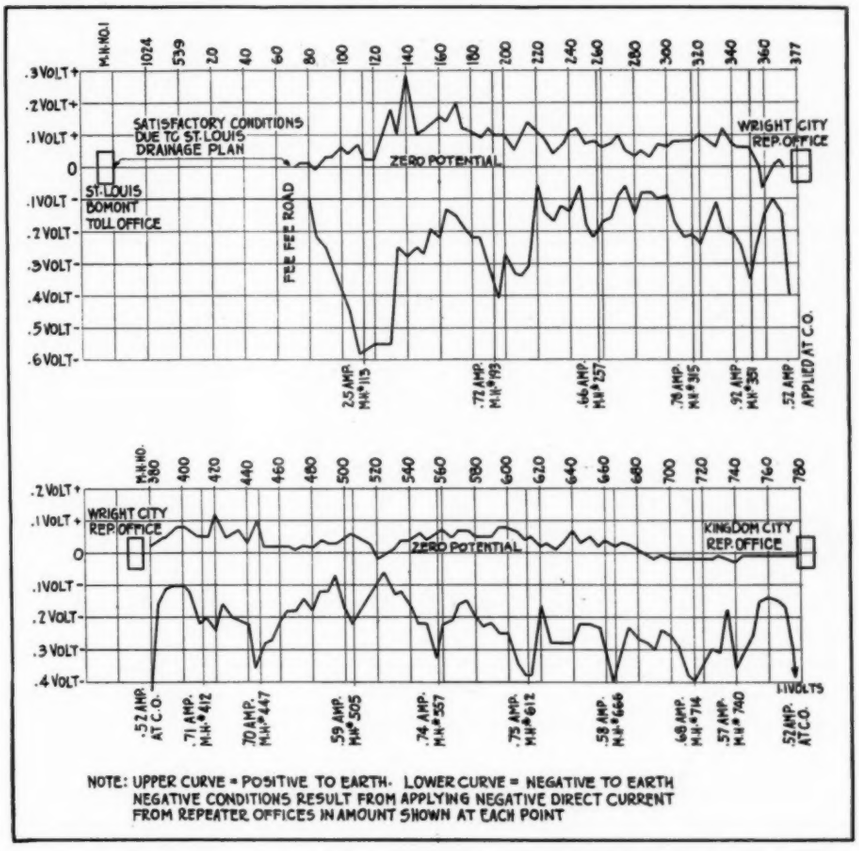


Fig. 3. Graphs Showing Electrolysis Conditions in the Bomont–Wright City and Wright City–Kingdom City Sections of the St. Louis–Kansas City Toll Cable.

Raising the earth potentials along the route of the cable by means of a counter-electromotive force applied to the sheath would, however, accomplish the same purpose.

There are several ways by which direct current might be applied for this purpose. One method is to use wet batteries connected in series with the cable sheath and suitable ground plates, or a series of driven grounds located some distance away from the cable and duplicated and installed at a sufficient number of points, probably every seven or eight miles along the length of the cable.

The use of wet batteries necessarily involves considerable routine maintenance. For this reason it was thought that small rectifiers would serve the purpose equally well and with less maintenance involved.

A survey indicated, however, that difficulties would be encountered in obtaining the necessary alternating current supply at

all points, and that private right of way for the made grounds would be necessary at some locations. The rectifiers, meters, and control equipment would also have to be suitably housed and aerial or underground construction provided for connection to the cable and grounds, so that the first cost of installation would be considerable.

Maintenance with either of these sources of current supply would also be high, involving, as it would, frequent inspections and expense for renewals of either batteries or rectifiers and also the grounds.

existing gas alarm terminals to bring out the conductors.

A scheme was accordingly worked out which involved the use of two non-loaded No. 19 gauge quads in addition to the No. 22 gauge tracer quad. Different combinations of the 12 conductors in these three quads were brought out at four points in both directions from each repeater station, the various combinations being so arranged that the respective resistances adjust the current to the value required at each point of application.

In addition, a half-ampere was applied

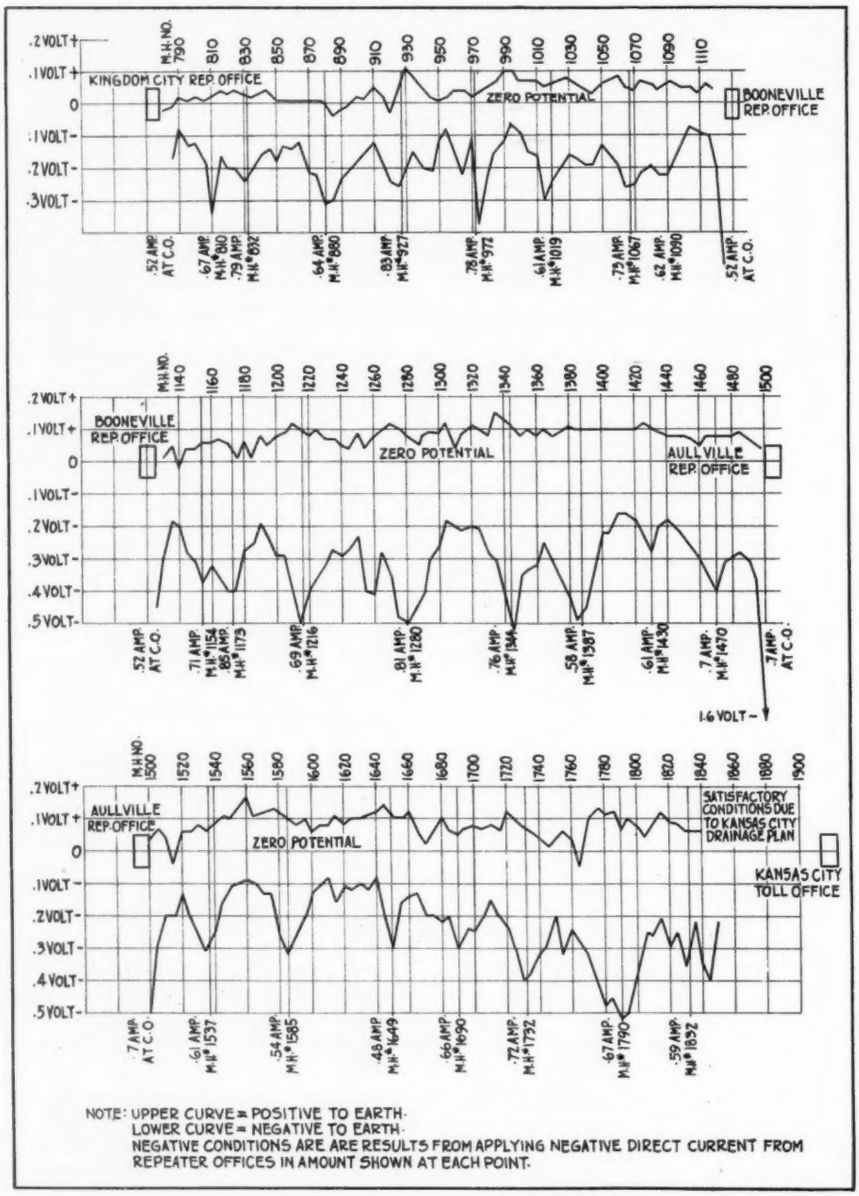

KINGDOM CITY REP. OFFICE
ZERO POTENTIAL
BOONEVILLE REP. OFFICE
BOONEVILLE REP. OFFICE
ZERO POTENTIAL
AULLVILLE REP. OFFICE
AULLVILLE REP. OFFICE
ZERO POTENTIAL
SATISFACTORY CONDITIONS DUE TO KANSAS CITY DRAINAGE PLAN
KANSAS CITY TOLL OFFICE
NOTE: UPPER CURVE = POSITIVE TO EARTH.
LOWER CURVE = NEGATIVE TO EARTH.
NEGATIVE CONDITIONS ARE ARE RESULTS FROM APPLYING NEGATIVE DIRECT CURRENT FROM REPEATER OFFICES IN AMOUNT SHOWN AT EACH POINT.

Fig. 4. Graphs Showing Electrolysis Conditions in Kingdom City–Booneville and Booneville–Aullville–Kansas City Sections of the St. Louis–Kansas City Toll Cable.

With these conditions in mind, the thought suggested itself of applying current to the cable sheath by means of conductors in the cable itself, distributed in both directions from already available battery in each repeater station, and using at each repeater station with the central office ground disconnected from the cable sheath and the sheath insulated from the racks in the cable vaults and the various distributing frames. The total average current used at each repeater station for application in both directions is six amperes. The total current consumption for all points, including three points out of Kansas City, is 26.32 amperes.

At Wright City, Boonville, and Kansas City, 130-volt telegraph battery is used. At Kingdom City and Aullville, 130-volt battery was not available and special motor-generator sets were installed to furnish the required current at these points.

The average efficiency for the battery arrangement is 52.4 per cent and for the motor-generators 61.7 per cent.

Fig. 1 shows a schematic diagram of the mitigation system as applied to the entire cable. Fig. 2 shows the typical layout of the conductors used, the points of application and distance between each point, the total resistance to each point, and the amount of current applied.

Since raising the earth potentials by the method applied merely transfers the corrosive action expected to occur on the cable sheath to the repeater station grounds, which consist of the deep well equipment at Wright City, Kingdom City, and Aullville, and would damage this equipment, arrangements were made to construct and substitute special long-life grounds at these points.

Results of Mitigative Scheme.

Insofar as it can be determined by potential tests, the forced drainage has evidently accomplished the desired results. Potentials to earth are negative at all manholes, and further corrosive action on the spare sleeves previously mentioned has evidently stopped, as evidenced by inspections at all manholes. New test electrodes were installed at the same locations as the previous ones and, when examined six months later, showed no corrosive effects.

Figs. 3 and 4 show graphically, potential conditions of the cable to earth for each repeater section before and after completion of the mitigative scheme. Fig. 5 is a representative picture of the pitting effects found on some 30 spare lead sleeves previous to the application of the mitigative scheme.

Cost of Mitigative Scheme.

The entire investment required by reason of the protective scheme amounted to $7,576, on which the annual charges are $1,085. Added to this is the cost of power, which is $1,800 annually, and the annual charges on two No. 19 gauge non-loaded quads amount to $2,880 a year, making the total cost per year for the mitigative scheme $5,765.

The third quad used in the scheme, a No. 22 gauge tracer quad, was used during the installation of the cable to substitute defective regular No. 19 gauge quads whenever such were encountered, and it is of no use for other purposes. Since it could continue to be used were any other No. 19 gauge replacements to be required, the annual charges on this No. 22 gauge quad are not held against the mitigative scheme.

The facilities under consideration protect 88 per cent of the total length of the St. Louis-Kansas City cable—256 miles. The investment in cable in the portion of the route protected by the special scheme is $2,153,737. This being the case, the cost of protection per year amounts to 27 hundredths of 1 per cent of the cable investment.

This seems a very reasonable cost for insurance against the effects of corrosion with inevitable resultant replacement from time to time of isolated sections of cable. Such replacements are always costly and are accompanied, especially in cases of comparatively heavy cable fills, with service reactions.

Then, too, there are difficulties involved in securing transmission conditions as ideal as those necessary and originally prevailing in connection with the replacement of a cable section in a cable which requires as careful balance as must be provided in intercity toll cables.

The outstanding features of this protective method are its stability and the very small amount of maintenance required. It is only necessary to occasionally check the current output in the connections to each point of application. This is done at the repeater offices by regular attendants.

The alternate method, as pointed out previously, is the application of direct current at various points along the route, by the use of wet batteries connected in series with the cable sheath and suitable ground plates or a series of driven grounds located some distance away from the cable in each case, or the use of small rectifiers at these points requiring access to alternating current supply.

Such a scheme has not the same stability, requires careful and regular system of field survey work, and has other objections which have been pointed out under the heading of "Mitigative Measures."

It is, of course, evident that a considerable portion of the power used is absorbed, or rather lost, by the high voltage drop in the conductors used to each point of application. If additional conductors were used so as to provide the amount of current required at each point of application using 24-volt battery available at all repeater stations instead of the 130 volts now used, a considerable saving could be effected.

It has been determined that the use of 10 additional No. 19 gauge quads, or 13 in all, plus the No. 22 gauge quad, would permit this to be done. It is estimated that the cost for power would then be cut down to about $50 a month, or $600 per year for the entire cable. This would mean, however, that the additional quads would have to be arranged and brought out at the various terminals, which would cost approximately $2,000 for the labor involved.

No accurate forecast could, at the time, be made as to when the additional 10 quads, if used for the electrolysis mitigation, would be needed for message service. If they were used for five years, the total saving in power cost would be $6,000, or a net saving of $4,000, deducting the cost of arranging and installing the additional 10 quads.

Five years is probably as long a period as could be safely assumed before the conductors may be needed for message service. In any event, at whatever time they would be needed, the saving would be further reduced by the cost of restoring to condition for regular use, which would amount to a further reduction in the net saving of approximately $2,000.

Considering all these facts, there seems to be no justification for changing to 24-volt current supply with the use of additional conductors.

Fig. 5. Representative Pitting Effects Found on a Number of Spare Lead Sleeves Previous to the Application of the Mitigative Scheme.

Conclusions.

The protective scheme has been in operation for nearly two years and, while there is no other definite evidence, except as mentioned, that it is preventing corrosive damage and consequent service failure, past experiences and practices and the evidence at hand indicate that it does accomplish the desired results.

The initial cost is undoubtedly much less than it would be for any other scheme that could be devised, and the cost of maintenance is practically nothing.

When considering the cost of possible cable replacements necessitated by service failures from corrosive penetration of the sheath and unfavorable commercial reaction from such failures, the cost of operation seems very reasonable in comparison. The unfavorable reaction on transmission features of a cable of this importance by reason of having a number of sections replaced must also be considered.

Apparently there is no reason why the scheme should not be considered permanent, since there seems to be no particular condition that may develop to necessitate supplementing or replacing it by any scheme of local drainage, except such as may be caused by the introduction and operation of grounded direct current power plants along the vicinity of the cable.

Such a condition does not now exist except along the urban ends of the cable, which is cared for by existing local drainage. Development of such plants which might affect the portion of the cable now protected by the present mitigation scheme, seems very remote.

The particular method of distributing and applying negative current from the central office to the sheath by the use of conductors within the cable to be protected, is the distinctive feature in this case and has probably never been previously employed in intercity cables.

The apparent success of providing protection at a comparatively small expense, considering the large investment represented by the cable, may indicate its use in connection with other cross-country cables, many of which no doubt are subject to conditions similar to the St. Louis-Kansas City underground toll cable.

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Teletype Printing Telegraph Systems

A Brief Description of Printing Telegraph Equipment and Its Many Applications—Development of Printing Telegraph—Types of Sending and Receiving Sets—Systems in Operation—Applications and Method of Operation—Part II

By A. S. Benjamin,
Sales Engineer, Teletype Corp.

The development of Teletype systems has closely followed that of the telephone field. The following are some of the systems now in operation:

1. A sending-receiving machine connected to one or more receiving-only sets on a single circuit to provide one way transmission.

2. Two or more sending-receiving machines on a single circuit arranged so that all of the machines on the circuit will receive the message transmitted from any station on the circuit. It is, of course, obvious that receiving-only machines could also be connected into the circuit to record the messages transmitted by any one of the sending machines.

3. A number of machines, either sending-receiving or receiving-only, each equipped with selecting units, connected to a circuit so that any sending station can select any one, group, or all of the stations simultaneously.

4. One-way radial systems consisting of a central station connected to a number of outlying receiving-only stations, and arranged so that the central point can send to any one, group, or all of the stations simultaneously.

5. Two-way radial systems, consisting of a central office and a number of sending-receiving outlying stations so that the central stations can send to any one, group, or all of the outlying stations, and any one of the outlying stations can send to the central office.

6. Full intercommunicating systems, similar to the two-way radial systems with arrangements for inter-connecting any two outlying stations on the system.

The TWX service (the abbreviation for "Teletypewriter Exchange Service") instituted by the Bell System in November, 1932, is a good example of this particular system. This service provides for two-way Teletype communication between any subscribers to the service. It does for the printed word exactly what the telephone service does for the spoken word.

Each subscriber to the service is furnished with a sending-receiving page Teletype which is connected by wires to a central office Teletypewriter switchboard, Fig. 7. This looks very much like the conventional central office manual telephone switchboard with the exception that the operator's transmitter and head set are replaced by a sending-receiving tape Teletype set.

Each subscriber is given a station number, the prefix of which is the name of the city and state or their abbreviation. The connections are established in a manner similar to telephone toll connections, all the instructions and information being handled over the printing telegraph sets.

Fig. 7. New York City Bell System Teletypewriter Exchange Switchboard.

A connection is established as follows: Assuming that station CGO100 (Chicago 100) is calling NY50 (New York City 50), the attendant at the calling station operates a switch on the printer set which lights a lamp on the switchboard. The Chicago operator answers by plugging into a jack associated with the calling station circuit and typing OPR on her printer.

The calling subscriber will then give the operator the number desired, in this case NY50, which is acknowledged by O. K. The Chicago operator then connects to a New York trunk line, and the New York operator acknowledges signal with NY, which is recorded on both the Chicago operator's monitoring and the calling station sets. The Chicago operator next gives the number NY50, which is acknowledged by O. K. from the New York operator.

The New York operator then connects the circuit to a jack associated with the called station circuit and rings a bell at that station to call the attendant. The attendant starts up her set and writes "This is NY50—Jones Company," which indicates that the connection has been completed. It is then possible for the two stations to communicate with each other.

The operator at the originating point observes from the tape on her machine that communication has started and enters the time on a ticket. When communication is completed, the attendant completing the message sends "END," which is acknowledged by the other attendant with "RECD O. K."

Each station then proceeds to send out the disconnect signal and the connections are taken down by the operators. The operator at the originating end makes note of the disconnect time, and the charges are based on the number of minutes consumed during communication; the minimum charges being for a three-minute period.

If the called station is busy, the operator will get a busy signal when attempting to make the final connection and would indicate this by writing "BUSY."

Some subscribers have unattended service; that is, the operator can start up the called station machine and tell the calling station to proceed with the sending.

7. A number of Teletype systems use automatic switchboards which closely resemble those used for automatic telephone switching. Each Teletype station is provided with a control box consisting of a cam key, dial unit and lamp.

If the calling station machine is idle, the lamp on the control box will not be lighted and a connection can be established by throwing the cam key on the control box which corresponds to the lifting of the receiver on a telephone, and dialing the called station number.

If the called station is not busy, the connection will be completed and the motors which drive the Teletype machines will start up, making possible the interchange of messages between the calling and called stations. At the completion of the message, the cam key at the calling station is restored to normal.

If the called station is busy, the connection will not be completed and the lamp at the calling station will light up, indicating this condition, in which case the control key would be restored to normal until such time as the station is not busy.

Teletype service has become almost in-

dispensable in the conduct of the world's business. Press associations utilize nation-wide networks to disseminate the world's news; stock quotations are carried from the heart of New York City to thousands of brokers in the United States and Canada; criminals are apprehended by the use of Teletype.

Each day telegraph companies carry nearly a million messages of joy and despair, while hundreds of instruments carry weather and general flying information over 13,000 miles of United States airways to make aviation safe for pilots and passengers. In fact, Teletype serves every imaginable business.

Teletype printing telegraph systems provide an accurate, rapid and flexible means of communication, the message being recorded in legible typewritten form. This type of communication makes possible the separation of the different units of a business so that offices and factories may be logically located with respect to markets, labor supply, material, power and transportation facilities.

A business may have its office and factory hundreds of miles apart, with a Teletype circuit connecting them. If machines arranged for handling printed forms are used, it is possible to fill out the necessary copies of an order at the factory at the same time that copies are made at the sales office. All of this work is done by a clerk at the main office and the transaction is handled as if the sales office and factory were located on the same premises and the orders distributed by the local mail boy.

The American Can Co.'s Teletype system, which was installed in 1926, offers a good example of the general application of Teletype to business communication. Fig. 8 shows a few of the sets which connect the main office to its seven plants in Chicago and suburbs as well as to plants and warehouses located in southern Illinois, Indiana and Ohio.

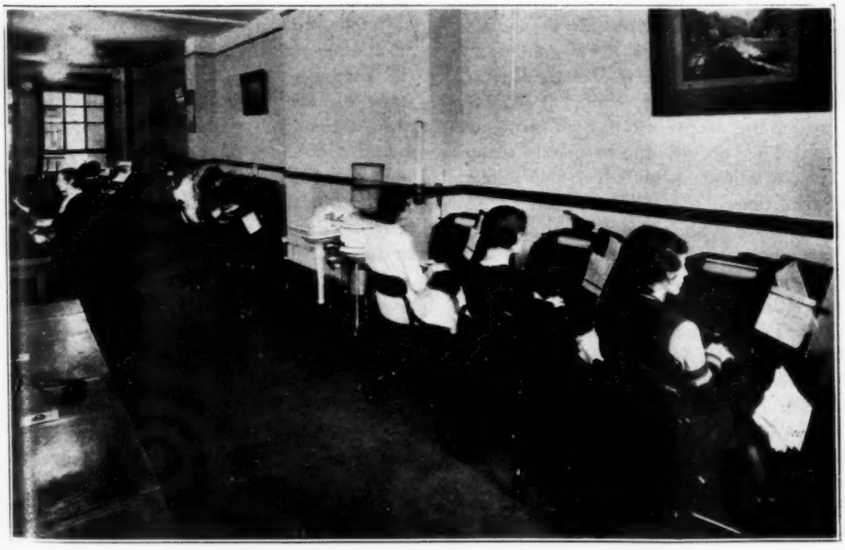

Fig. 8. Chicago Main Office Telegraph Department of the American Can Co.

These facilities are used for the transmission of orders, securing shipping promises and general factory and office communications. An average of 2,000 messages is handled daily. In addition to these private wire connections, which are leased from the Bell System, Teletype sets which connect to the Western Union and Postal Telegraph offices are available for handling commercial telegrams to and from all points in the world.

A Teletype set connected to the Bell System Teletypewriter exchange system gives the American Can Co. direct printer connection with all subscribers to that service.

The Chicago office of the Pettibone Mulliken Co. represents a typical small Teletype installation. The sending page Teletype set arranged for feeding forms being operated by the young lady, Fig. 9, is connected to two receiving-only sets located in the factory production office about one-quarter mile away.

Each machine produces six copies of the order, the 12 copies at the plant being automatically typed and removed by the production manager whenever a few orders are accumulated. It has been reported that Teletype gets orders into production in one-fifth the time formerly required.

The tape-recording Teletype set and its associated gumming desk mounted at the left of the instrument is a typical telegraph company subscriber's set. In this particular case, it is connected to the Postal Telegraph Co.'s main office.

The commercial telegraph companies, up to the present time, have been the largest single users of Teletype printing telegraph equipment.

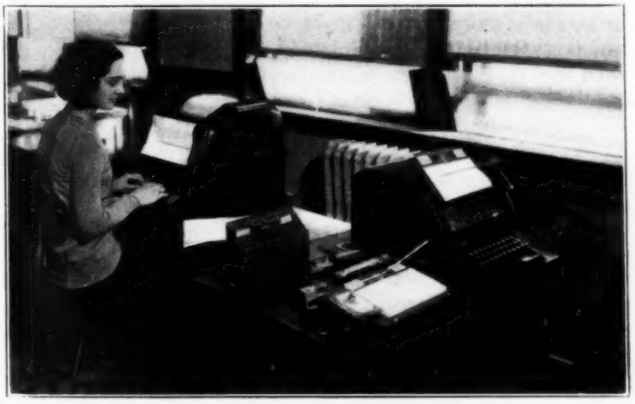

Fig. 9. Teletype Equipment in the Chicago Main Office of Pettibone Mulliken Co.

All of their main traffic centers are connected together by multiplex equipment which permits the transmission of as many as four simultaneous messages in each direction over a single channel; each channel operating at approximately 60 words per minute. Thus, under certain condition, it is possible to handle as many as 480 words per minute over a single channel. Tape transmission and tape recorders are usually used for this class of service.

The telegraph companies have installed direct-sending tape Teletype printers in a large number of their branch offices and on the premises of most of their large customers for handling telegraph messages between these offices and the main office of the telegraph company.

The customer's and the branch office machines are connected by wires to main office concentration units so that a large number of these sets can be served by a comparatively small group of main office operators, the number depending upon the amount of traffic to be handled.

A branch office or customer desiring to transmit a message signals the main office by depressing a key. An idle operator connects her machine to the circuit and receives the message.

At the completion of the message, the central office operator disconnects her machine from that circuit and is ready to answer another call. If the main office operator has a message for one of the customers or branch offices, she connects her set to the particular station desired and proceeds to transmit the message.

In November, 1932, the Postal Telegraph-Cable Co. and the Western Union Telegraph Co. introduced a joint service called "TWS," timed wire service. All customers who have either Postal or Western Union printers, have been listed in a

directory and it is possible to send a TWS message from any one to any other machine listed.

A message can be originated on a Western Union machine and be delivered to a Postal instrument and vice versa. This is a one-way service and no direct connection is established between customers.

To send a TWS message, the attendant signals the telegraph company's operator, who answers by writing GA (go ahead). The customer then types "TWS," indicating that such class of service is desired. The telegraph company's operator then transmits the letters "BK," meaning stop, and proceeds to connect the customer's printer with a timed wire service circuit.

When this connection is established, the letters GA TWS are transmitted, meaning go ahead with the TWS message. Upon receiving this symbol, the customer proceeds to send the name and office destination of the addressee, followed by the sender's name and office destination. For example: "TO SMITH & COMPANY CHICAGO— FM A B JONES & COMPANY NEW YORK" followed by the message.

The completion of the message is indicated by "END TWS," followed by five bell signals. The telegraph operator keeps a record of the time elapsing from the start of the message to the time when the bell signals are received. The minimum charge for a message is three minutes.

In some cases the message is received at the telegraph office on a printed tape and is transmitted over trunk circuits to the distant point where it is retransmitted to its destination. In some of the larger offices reperforators are connected to the circuit and the message is perforated on a tape which is, in turn, passed through the transmitter connected to the trunk circuits.

At the distant point, a reperforator might be connected to the trunk circuit for preparing a tape to be used in transmitting the message to the addressee.

To deliver a TWS message, the operator signals the customer and, when the acknowledgment is received, sends TWS. The customer then sends the "GA TWS" indicating that he is ready to receive the message. After the message is completed, the telegraph operator rings the bell on the printer five times, indicating that the message is completed.

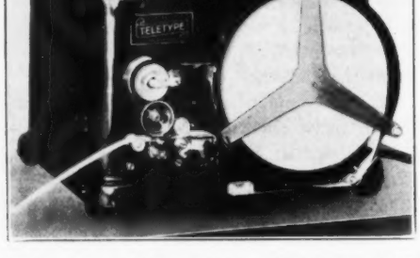

Fig. 10. High Speed Teletype Stock Ticker.

The patron's operator acknowledges receipt of the message by writing "TWS RECD OK," followed by the patron's wire office call.

Stock quotation service is another large application of Teletype. The name of the security in abbreviated form, amount sold and price of each transaction is recorded on a slip of paper. It is handed to one of 200 reporters on the floor of the New York Stock Exchange, who in turn passes it to one of six operators who perforates the information in a tape which is then passed through a nearby tape transmitter.

The six transmitters are operated successively and control a reperforator which prepares a tape for a master transmitter. This master transmitter operates approximately 6,000 high speed Teletype tickers in offices of members of the exchange located south of Chamber Street in Manhattan. This service is rendered by the New York Quotation Co., a subsidiary of the New York Stock Exchange.

The Western Union Telegraph Co. retransmits the quotations to approximately 9,000 Teletype tickers, Fig. 10, located in every important city in the United States, Canad and Cuba and outside of the territory served by the New York Quotation Co.

The first high-speed Teletype tickers, which record at the rate of 500 characters per minute, were installed in September, 1930. They operate approximately twice as fast as the instruments which they replaced at that time. The new unit can keep effective pace with a 7,500,000 to 13,500,000 share daily turnover, depending upon the number of tape impressions required for each transaction.

The press associations disseminate practically all news in the United States and Canada over Teletype systems. Tape transmission and page recorders are most commonly used to transmit the news to thousands of newspaper offices. A few tape recording machines are used by the press associations for handling stock quotation tabulations.

Teletype service plays a very important part in the detection of crime and the apprehension of criminals. The fast dissemination of information regarding a crime, forms a net which helps to catch the criminal and offsets the advantages which he has in rapid transportation.

At the present time practically all key cities in various sections of the United States are connected together by Teletype networks. A crime committed in one of these cities is immediately reported to all of the other cities on the network, and may be transmitted to hundreds of Teletypes connected to local police systems.

Fig. 11. Trenton Transmitting Station of New Jersey State Police Teletype System.

The big problem in police communication is to disseminate crime news to a large number of persons after a crime has been reported to headquarters. The telephone provides a means of getting crime information from various locations to headquarters, the transaction involving two men. When this information is to be broadcast, the necessity of calling in a large number of men on the telephone to receive the message slows up the process considerably; and it is for this particular application that Teletype supplements the telephone.

By the use of Teletype equipment, Fig. 11, the operation of a single switch will start up the receiving instruments at all the stations. By manipulating one keyboard, the message can be transmitted simultaneously to all of these stations and recorded automatically in typewritten form without the necessity of having attendants at the machines.

Most of the municipal installations are arranged so that messages can be sent to any station, group of stations, or all stations simultaneously.

The first municipal Teletype installation was made in the city of Chicago in 1922. Originally there were 37 receiving stations, which has increased to 46 at the present time.

When a message is received in the complaint room, it is transmitted over the Teletype system to the station or stations interested in that particular news. The only work required of the operators at the precinct station is to remove the completed messages from the Teletype.

Rolls of paper are used on the instru-

(Please turn to page 27.)

Here and There in Telephone Work

Secretarial Service As Supplied to London, England, Subscribers.

Secretarial service for telephone subscribers, the use of which has gradually grown in this country in recent years, is available in England through Cetex, Ltd., which started operations the early part of this year.

The British Post Office has a monopoly of all matters connected with the handling of messages, whether by mail, telephone, telegraph or radio, with one exception: the monopoly does not extend to messages originating from, or intended for, places outside the United Kingdom of Great Britain and Northern Ireland.

It was, therefore, necessary for the Cetex company to obtain from the Postmaster General a license permitting it to infringe the Post Office's monopoly, which was granted. At the present time, it is stated, the secretarial service is restricted to the London telephone area where there are approximately 353,000 subscribers, of which about 70 per cent. are commercial users and the rest are private individuals. The service is expected to be extended throughout the British provinces in the future.

The telephone service in Great Britain is run as a government department so that the company was not allowed to install special equipment in the actual exchanges (there are 228 local exchanges in the London area).

Furthermore, it is stated that the Post Office is not prepared to install any equipment to permit of the subscriber's line being switched through at will to the Cetex company's plant, except by the installation of a private wire, which is comparatively expensive.

The Cetex company, therefore, operates by two methods. By use of the first method, the subscriber advertises by printing on his notepaper, etc., that messages can be left for him at "Cetex, Sloane 4554"; and the calling party, finding no reply to a subscriber's number and knowing him to be a subscriber to the Cetex service, rings Sloane 4554 and leaves his message there. The Cetex subscriber makes his own arrangements for collecting these messages.

The charges for this service are, for a commercial firm, £3. 3. -. for six months or 500 usages, whichever the shorter; and for a private individual, £1. 1. -. for six months' service or 125 usages, whichever the shorter.

For an additional payment of about 15/- per six months (payable to the London Post Office, out of which Cetex receives nothing), both types of subscribers can, if they so desire, have the following wording inserted underneath their entry in the telephone directory: "If no reply, ring CETEX day or night SLOANE 4554."

The second method operates in the following way: A private wire, or rather an external extension, is rented by the subscriber from the government telephone service and runs from his firm to Cetex company's equipment. When the subscriber, therefore, leaves his telephone unattended, he is able, by the turn of a switch, to direct all his incoming calls to CETEX.

The charges made by the Post Office for such a line (no part of which goes to Cetex) are £5. 16. -. per year for the first half-mile, plus £1. 8. -. per year for each additional furlong or part thereof; the distance being measured "as the crow flies" between the Cetex equipment and the subscriber's telephone. In addition to this charge, Cetex makes a charge of L10. 10. -. per year for unlimited service.

Owing to engineering difficulties over long distances, all of the London telephone area cannot be operated from the Cetex equipment at the present location, so that additional Cetex exchange will have to be opened at strategic points in the London area.

In both cases, all out-of-pocket expenses, such as calls made on behalf of a subscriber, are paid by the subscriber in addition to his subscription.

Last of Subscribers Listed in First Telephone Directory.

The mis-spelling of his name on February 21, 1878, when it appeared as "Dr. E. L. R. Thompson" on the small card which was the first telephone directory ever published, has for many years caused telephone folks to overlook the fact that such a distinguished person as Dr. Ernest LeRoy Thomson is the only living original subscriber. He has been living at 963 Elm

MENTAL STATURE

By Anne Barnes,

Traveling Chief Operator, Iowa Independent Telephone Association, Des Moines, Iowa

No matter how tall or short we are, that is one physical condition we are unable to change. However, our physical makeup, otherwise, is affected by what we *do, think, read, eat,* what *exercise* we get and *our outlook on life.* Some of these things might not have affected us adversely if we had obtained a better start in childhood; had been taught not to be willful, selfish, greedy, etc. We know these things, if not restrained, injure and change us, both inside and out, as life goes on.

For instance, I know a woman who makes life difficult for herself and others, whenever her will is crossed in any way, because she allows herself to indulge in minor negative impulses. Of course, such indulgences affect her physically and mentally.

After all, our big accomplishment—the one left strictly up to us—is *building our mental stature.* We may add cubit after cubit to its height if we so will, no matter what the odds. Lincoln never could have become a historical figure on account of his physical height. He found his power in his high mental stature.

If we would acquire a high mental stature we must get into the habit of looking up instead of down. Some folks are actually mentally round-shouldered because they walk on the low levels of their nature and mire their mental feet in weak impulses. Of course, we all find ourselves walking on these low mental levels at times. We are never at our best then, or able to help others as we would like to. We cannot hope to see much, enjoy much, or learn much if we travel a great deal on our lower mental levels. Money buys only temporary entertainment which satisfies us for the time being. And much of it does not add a single cubit to our mental stature.

Sometimes, we think it is harder to grow tall mentally than it would have been to grow tall physically. If we could have had our choice we possibly would have preferred the latter responsibility. But it is a mighty fortunate thing that our physical height rather than our mental height was not left up to us, for some of us might become giants physically and pygmies mentally.

Many of those who have reached the highest pinnacle of success began their work where it happened to be and where they happened to be, rather than going in search of something different and more to their liking.

MORAL: In hard work there is *mental growth* for all.

FLASHES AND PLUGS--NEWS BRIEFS, COMMENTS

According to the radio reporter of the Chicago Herald: "Next time you hear a telephone number used in a radio sketch, call that number and your reward will be a busy signal and your nickel back!

"Why? Well, it seems Amos 'n Andy once used any old number to call Mme. Queen—and for days the poor subscriber who held that number was besieged with inquiries as to whether Andy's girl friend really lived there. Number finally had to be changed. Now, the telephone company supplies regular test numbers to radio folk who must liven up their dramas with telephone calls."

* * *

E. W. Clausen of St. Louis, Mo., rate attorney of the Southwestern Bell Telephone Co., recently acquired an antique walnut desk, once the property of Gen. William Tecumseh Sherman, merely for the trouble of hauling it away. The piece is 9½ feet high, 4 feet wide, and is finely finished.

Mr. Clausen overheard a barber offering the desk to a customer if he would take it away. The customer declined and Mr. Clausen eagerly accepted the offer.

* * *

In Hungary there are 1,046 telephone exchanges having less than 100 subscribers, and 900 with less than 20. This represents 82.4 per cent of the total telephone equipment.

* * *

An anonymous paragrapher in Public Utilities Fortnightly says: "To determine how a friend has weathered the depression, look him up in the telephone directory. If his name is still listed, then he fared well; if his name is not listed, then perhaps he would have fared better if it were."

Awkwardly phrased, but the germ of a truth is there. It is a boost for telephone service.

* * *

William E. Shrader, Iowa City, Iowa, oldest business man who died last month, was one of the 14 original telephone subscribers when the local exchange was opened in 1881. His telephone was in his drug store. It occupied the same location in the store during the 52 years, although the type of instrument was changed several times. Manager Carl Cone of the Northwestern Bell company said this is a record.

* * *

Telephone traffic to Warm Springs, Ga., leaped up amazingly after President Roosevelt arrived for his vacation. Nobody could contact him, however, unless they knew his private number.

* * *

At Youngstown, Ohio, Police Desk Sergeant Quinlan receives an average of 30 telephone calls daily, requesting that he send someone to pick up the laundry. The reason: A Youngstown laundry has an advertisement in the classified section of the telephone directory which displays the police number more prominently that its own number.

All of which shows it pays to have a telephone and "it pays to advertise."

* * *

Investigation shows that the longest telephone conversations at Columbus, Ohio are in the Lawndale-Jefferson exchange. The average is 197 seconds—3 minutes, 17 seconds—per call.

* * *

The smallest telephone company in Ohio, the Snortin' Ridge Telephone Co. of Revenge, Fairfield County, has asked the state commission for authority to establish a service rate of $1 a month. It has 14 subscribers, all on a single line.

* * *

Marion Holmes in the Chicago Daily News tells an inquirer that 317,128 telephone calls were received at the White House in 1931, with 99,294 outgoing calls.

That is one instance of income being larger than outgo.

* * *

Among the prominent men connected with the telephone industry, who called recently at TELEPHONY's offices, was J. Innes, managing editor of the Postoffice Electrical Engineers' Journal of London, Eng. Mr. Innes was a visitor at the Chicago World's Fair and naturally spent a good deal of time at the telephone exhibit. He has seen considerable service in South Africa, in addition to Great Britain. Mr. Innes expresses faith that the telephone will see a marvelous advancement in the next decade.

street, New Haven, Conn., known to dozens of friends and former patients. They remembered him on October 23 when Dr. Thomson observed his 84th birthday.

A few years ago an effort was made to determine if any subscribers listed on the original directory of the New Haven exchange, the first in the country, were living. After the death of Emil A. Gessner, proprietor of Apothecaries Hall, it was thought the last of the original subscribers had passed away. There was no "Dr. E. L. R. Thompson," or "Dr E. L. R. Thomson" in the telephone directory. But recently it came to light that Dr. Thomson is very much alive. At his request, Mrs. Thomson called the company to tell the facts. The telephone is in her name.

Dr. Thomson has been an invalid for years. He remembers only dimly his first telephone. It was a magneto type instrument. He cranked a bell to call the operator. But he thought at that time the telephone was "a wonderful invention" and now believes that it has proved to be one of the greatest.

He knew intimately some of the first telephone subscribers. Some of them were his patients, particularly Morris F. Tyler, president of the company from 1883 to 1907, and Emil A. Gessner.

After his graduation from the Yale School of Medicine in 1874, Dr. Thomson set up his practice in "Mrs. Benjamin's house" on Crown Street, stayed there three years, then moved to Elm Street, where he was when the telephone was first installed.

It is difficult for Dr. Thomson to remember way back to the days of his first telephone. He lies abed and reads much. Beside his bed, hanging from a thumb tack on the wall, is a photographic print of the first telephone directory. And Dr. Thomson is very proud of the distinction of being the last living subscriber on that list which was published in 1878.

SELLING THE SERVICE

By JOHN G. REYNOLDS.

1. I have often heard operators state that they did not have the same opportunities for making sales as outside employes. But, in my opinion, an alert and active operator can obtain prospects by watching slow answers, busy lines, and calls for information where people are being called who have no telephone. The operator who remembers such cases, can gather valuable information which should convince the prospects that they really need new or additional service.

2. It is a fact, but telephone convenience is one thing people consider when they are looking for a room. An extension telephone in each room of a rooming house, would not only help the owner to rent the rooms but would also aid him in obtaining more money for the rooms. How many of your friends keep roomers? See them at once and endeavor to sell them extensions.

3. How many retail stores in your locality realize the fact that when adequate telephone service is provided for receiving orders by telephone, they have another sales outlet? Many people are not always able to visit stores to make their purchases and such persons are likely to place their orders with stores having telephone service. Get busy, Mr. Manager! Go to work on the stores in your town. Business can be developed by persistently going after it.

4. Never let a man's personal appearance or the type of home in which he lives, keep you from trying to sell him telephone service. Many poor-appearing people have more money than those who appear to be well-to-do.

5. Schopenhauer, once said: "A word too much always defeats its purpose." Truer words were never said, and all salesmen should remember that one word too many can ruin a sales talk!

Bell's Massachusetts Rate Case Closed

New England Telephone & Telegraph Co.'s Rate Case in Hands of Commission—Company's Counsel Presents Concluding Argument Defending Dial System, Bell License Contract and Depreciation Policy—Marshall Rebuts

So extended were the closing arguments in the rate case of the New England Telephone & Telegraph Co. before the Massachusetts Department of Public Utilities on November 22 and 29 that TELEPHONY has been presenting their major features to its readers in sections. The case has been in progress for three years, but went to the commission on November 29 for decision, following the completion of the company's side and a short rebuttal argument by the petitioners.

An account of the argument of Wyckliffe C. Marshall, representing the Boston Central Labor Union (against the company) was published in TELEPHONY of December 2, and in the December 9 issue a substantial part of the company's argument as presented by George R. Grant, its general attorney, was printed. In the following paragraphs the closing portion of Mr. Grant's argument is given in extract form, with the burden of Mr. Marshall's concluding speech.

Manual vs. Dial Operation.

Taking up Mr. Marshall's contention that machine-switching development was directly responsible for the large increase in the total capital of the New England company between 1921 and 1929, Mr. Grant reviewed the testimony of Chief Engineer George K. Manson in denial of this allegation. Mr. Manson said:

> The total plant increase during that period was $143,831,755. If you take the entire investment as of 1929 (December) in the dial central office equipment and in the buildings that are housing it, and make a liberal allowance for the increased cost of dial stations . . . the figure of $40,000,000 would be a liberal outside allowance out of that total increase of nearly $144,000,000.

It appears from this testimony, said Mr. Grant, that Mr. Marshall was in error to the minimum of $103,831,755. If the company had not installed the dial equipment, it would have built much more of the manual equipment and new buildings to house it. Dial equipment was responsible for only a small percentage of the increase. The real cause of increased capital was added plant for new business.

Mr. Manson's testimony gave in great detail the facts concerning the increase in company stations between 1921 and 1929, as well as increased toll usage, and stated that the plant was built to handle this increase in business, to overcome deficiencies in plant existing in 1921.

With respect to subscribers' stations, $1,000,000 would be a liberal allowance for the increased cost due to machine switching, and expressed in ratios, Mr. Marshall's contention was 90 per cent in error as to the cause of the increase. Put in another way, the increased investment per station during that period was about $10, of which about $1 was due to dial equipment. Mr. Marshall did not cross-examine Mr. Manson on this subject.

Purchase of Instruments.

Another factor which increased the cost per station of station apparatus and equipment was the purchase of transmitters, receivers and induction coils from the A. T. & T. Co. This added an investment of $2.50 per station, following the reduction in the license payment. The balance of the increase in the cost per station was due to the higher cost of equipment and the larger and more expensive P.B.X.'s. Other items which increased this cost per station were covered in the Manson testimony.

Mr. Marshall charged what he called an annual loss of $824,231 to the use of dial equipment. Mr. Manson denied this and pointed out that the average costs of dial equipment had been erroneously compared with assumed manual costs. Mr. Marshall arrived at $6.07 per station as a saving in operators' wages and repair expenses due to machine switching. His estimate of the total saving on this account was $1,561,616.

He arrived at a total increase in annual charges on land, buildings and general equipment of $2,385,847, from which he deducted his assumed savings in operating expenses of $1,500,000, and reached $824,231 as his asserted annual loss which the company has made in Massachusetts due to transition to the dial system as of 1930.

Mr. Manson showed the errors and inconsistencies in the method Mr. Marshall followed. He summed up the whole matter in a company exhibit, which showed without contradiction that the company's expenses were less by $145,000 in 1930 than they would have been if the then dial offices had been operated on a manual basis. Mr. Marshall's error on this point was of the order of $1,000,000 a year. He saw fit to refrain from cross-examination of Mr. Manson concerning that error and from any reference to it in his rebuttal testimony.

Dial System and Employes.

Mr. Manson contradicted references in Mr. Marshall's exhibit concerning the alleged responsibility of the dial system in the decrease of the number of employes. (At present, Mr. Grant stated, 18,579 persons are employed by the New England company.) Mr. Manson's testimony showed that changes in construction programs and operating practices have been more largely responsible for reductions in the past few years. In answer to a query from Commissioner Webber, Mr. Manson stated that practically every large city in the world uses machine switching.

Mr. Manson further contradicted the Marshall contention that overbuilding had resulted from the change from manual to dial. He, of course, admitted that due to the depression and loss of stations, some of this plant is under-used; but this in no way indicates overbuilding nor takes away the right of the company to earn a return upon such property. As the Michigan commission said in the Detroit Edison case:

> The fact that today a substantial reduction of the demands made by its customers has decreased the percentage of plant capacity (in use) cannot change the admitted fact that all the investment was needed when it was made, and at that time the company was clearly entitled to earn upon all the property.

The Massachusetts commission considered the question of machine switching in the 1925 rate case. In its order it said in part:

> It appears, however, to be the best opinion in the telephone art today that the introduction of machine switching will, in due time, result in a distinct and appreciable saving; and it is the firm belief of the company that it (machine switching) will, in time, result in a more compensating reduction in annual operating charges and in better service.

Mr. Manson's testimony amply justifies the conclusions which the commission reached in the earlier case, Mr. Grant stated.

License Contract Values Remain.

Mr. Marshall's attack on the license contract was scattered and contains many extravagant statements. He guessed that the amount of the license payment by the New England company to the A. T. & T. Co., should be $250,000. He produced no figures to substantiate this. He assumed that the use of patents by the New England company constitutes the largest benefit of the agreement. This Mr. Manson denied.

The latter enumerated many of the services rendered by the American company under the contract and said that they were necessary services which the New England company could obtain in no other way. Mr. Manson pointed out that the contract is the same as in 1925, except for the reduction of the payment from 4½ per cent of

gross revenue to 1½ per cent, and the present ownership of instruments by the New England company.

He stated that the services are more valuable and more numerous than they were in 1925, due to an enlarged plant; that the license contract aids the New England company in connection with all the latter's fundamental plans; and that great savings and benefits have come to the New England company through the use of carrier cables, the multiplex system, improvements in transmission, sender tandem board, vacuum tube repeaters, loading coils, improved traffic and commercial practices and many other matters by virtue of this contract.

The testimony of Robert F. Estabrook, operating vice-president, confirmed the benefits to the company of the contract in regard to operating, maintenance and traffic practices.

In the 1925 case Mr. Manson estimated the capital saving due to the license contract to be $30,600,000 as of December 1, 1924, in Massachusetts, and that savings in annual charges were about $5,058,000. These savings, he testified, are greater today because they apply to larger and more complex properties. Mr. Grant ridiculed the alleged idea of Mr. Marshall that the New England company could obtain a large part of the assistance it required in conducting its affairs from magazines.

Mr. Manson denied Mr. Marshall's assertion that interstate service receives the greater portion of the benefit from the contract, and pointed out that not over 5 or 6 per cent of the plant is devoted to interstate traffic.

This same license contract is in effect between the A. T. & T. and all the subsidiary operating companies of the Bell System. Courts and commissions throughout the land have approved it. In the 1925 rate decision the Massachusetts commission reached the opinion that the American company furnishes its services at a little above cost, and that the service is worth what the New England company pays for it.

"It is perhaps but natural," said the board at that time, "to look with suspicion upon contracts between companies with such intercorporate relations, but we are constrained to say that we cannot find upon the evidence that this (then) 4½ per cent license contract was either a dishonest or an imprudent one for the New England company." "That stands true today," Mr. Grant declared.

Depreciation Rates.

Upon the subject of depreciation, Mr. Manson testified that the company establishes from time to time component rates of depreciation for all classes of its property; reduced to a composite, these show a present rate of 4 per cent. In connection with this subject, Mr. Marshall, and also F. H. Sullivan, questioned the witness at great length concerning the subject of poles from the standpoints of shipments, quality and price. Mr. Manson stressed the policy of the company in buying poles where it can do so to the best advantage, consistent with proper quantities and deliveries.

Mr. Manson's explanation of the general subject of depreciation occupies many pages of the record. He explained carefully his method of arriving at service life in years, gross salvage, cost of removal, net salvage and per cent of annual depreciation. It may be, declared Mr. Grant, that his testimony upon depreciation was more exhaustive than was necessary, inasmuch as Mr. Marshall has produced no competent testimony to the effect that the component rates now charged by the company are too high.

Western Electric Contract.

Mr. Marshall charged that the Western Electric Co. exploits the New England company through sales of apparatus, material and supplies which are unnecessary in order that the Western Electric Co. may be kept busy. This, Mr. Manson denied. He called attention to the fact that the Western Electric Co. is operating at about 15 per cent of its capacity, and this negatives the idea that the operating companies are buying to keep it busy.

"The fact is," said Mr. Grant, "that the New England company buys apparatus and supplies from the Western at the latter's most favored customer prices, which are lower than it could obtain from other manufacturers."

The Massachusetts commission went very thoroughly into this question in the 1925 rate case. In its report and order it stated that the Western company fits into the Bell System as a cooperative enterprise and that it believed that the New England company, by acquiring supplies from the Western, using its warehouses and its services as purchasing agent, obtains what it requires cheaper, on the whole, than it could elsewhere. Mr. Manson testified that this statement is true today.

Charges that Company Is Unprogressive.

Statements by Mr. Marshall on the one hand that the New England company is extravagant in its installation of modern equipment and on the other hand that it is not progressive because it has failed to install modern apparatus, emphasized the futility of any attempt to apply the record to the issues of this case, Mr. Grant asserted. Using a newspaper clipping printed last April, Mr. Marshall asked Mr. Manson whether he was familiar with the so-called "by-path" method of handling telephone conversations.

Mr. Manson replied that he had never heard of it, but after reading the article he stated that the scheme apparently contemplates saving floor space by accommodating all the equipment of an exchange of 3,500 lines on one floor. Mr. Manson stated that this could be done without the use of any such scheme.

Mr. Marshall then argued that the "by-path" indicates obsolescence in the company's system, a proposition too ridiculous to cause a reply. However, this gave Mr. Manson the opportunity to point out that obsolescence is not a primary cause of plant retirement, and that inadequacy is a far more important factor.

The Whitney Rate Testimony.

Lambert N. Whitney, assistant operating vice-president of the New England company, and a veteran telephone expert of 37 years' experience, pointed out serious errors in many of the Marshall exhibits. Only a few could be touched upon in Mr. Grant's argument.

The change in the company's rate schedules which Mr. Marshall and Mr. Sullivan most strongly recommended is the elimination of all flat-rate service. In his advocacy of this idea Mr. Marshall made comparisons between the amount of service measured and the amount unmeasured expressed in dollars. Here he considered only main stations. Mr. Whitney pointed out that the only fair comparison of the service that is measured with that which is not measured should include excess measured service and 5-cent toll service in metropolitan Boston associated with the flat rate service, public telephone service and a certain amount of P. B. X. measured service.

The Whitney testimony said: "The amount of measured service that has been omitted (by Mr. Marshall) totals over $9,000,000 a year in metropolitan Boston. Obviously any comparison of measured with flat rate service which omits such an amount as that prevents the exhibits from indicating anything. . . ."

The same types of errors were found in connection with the unlimited and measured service comparisons for other parts of the territory outside metropolitan Boston.

The elimination of all flat-rate service as advocated would increase the cost of rendering service, due to the added costs involved in recording measured service use, and would unduly restrict and irritate patrons.

"It is ridiculous," said Mr. Grant, "to compare present telephone rates with those in effect 20 years ago. Mr. Marshall made such an attempt in a long series of exhibits. The number of stations in that period has trebled; the speed of the service has greatly increased, and the subscriber today is getting more for his dollar." Since the 1925 rate case, the company has made voluntary rate reductions totaling over $1,000,000 a year.

Proposed Bases for Reductions.

Mr. Marshall advocated certain factors to be used in his scheme for reducing telephone rates: investment, population, areas

and circuits. The Whitney testimony showed quickly that the investment basis would give to the small exchanges the same rates as are charged in cities like Worcester and Springfield; and that the population basis would give the patrons in some of the mill towns higher rates than residential cities with many more telephones but smaller populations.

Such factors cannot be brought together for any value in rate-making. "Can you imagine the reaction of telephone users in Dover and Huntington," said Mr. Grant, "if they were asked to pay the same rates as Springfield, having approximately 40,000 stations?"

Criticizing the Marshall proposal of grouping agency offices together for rate purposes, Mr. Whitney's testimony pointed out its fallacy, showing that a small agency exchange like Middlefield with 60 stations would have the same rates as Groton with 600. In the company's system of rates, exchanges are grouped for rate purposes with respect to their telephone development rather than with respect to areas, populations or investment.

The Whitney testimony asserted that this is the fairest and most satisfactory telephone rate treatment known to the witness. The making of changes along the lines advised by Mr. Marshall would increase many rates, cause grave inequalities and cause a loss of revenue which the depleted condition of the company's finances does not possibly permit. Such changes at the present uncertain time would make for unstable and unsatisfactory rate set-ups.

Service Charge Idea Impracticable.

"Mr. Marshall attempted to introduce two sets of different service charges," Mr. Grant declared. "He forgot the first, which is in conflict with the second. Because of the general public dislike for service charges, he has tried to avoid that term and has called it a 'customer charge.' However, in the record he called it a service charge and asserted this to be the definition which anyone in a rate proceeding would give it. The company is opposed to the service charge idea and has established minimum charges which are less objectionable to patrons because they are absorbed in the use of service."

The Whitney testimony summarized the Marshall exhibits by saying that they present no real proposed rate schedule; that the proposed type of rate structure which contemplates a uniform service charge without regard to type of service or variation between large and small exchanges, is contrary to the desires of the company's patrons; and that the proposed rate levels are unsound and mathematically incorrect.

Cross-Examination of Whitney.

Mr. Marshall consumed six days interrogating Mr. Whitney. Few if any of his questions constituted real cross-examination, said Mr. Grant. They had no reference to the specific criticisms which Mr. Whitney made of the Marshall exhibits. For the most part they were immaterial, Mr. Grant maintained. They seemed to be in the nature of a smoke screen to conceal Mr. Marshall's real ability to interrogate the witness upon his valid criticisms of the complainant's exhibits.

"Many of the questions were based upon ridiculous assumptions," said Mr. Grant. "Mr. Marshall asked the witness to assume such impossible conditions as a subscriber living in a house without partitions, who had his telephone stations and extensions operated on tracks by means of reels which, when functioning, would bring the telephone instrumentalities to the subscriber. He said he drew this picture to show 'velvet' in certain rates. Commissioner Wells stopped this line of questioning by asking if Mr. Marshall ever heard of anyone who had such a service."

In the so-called rebuttal exhibits, Mr. Marshall presented certain recommendations for changes in telephone rates in Massachusetts. He stated that these would save telephone users from $8,000,000 to $10,000,000 a year, and reluctantly admitted in reply to questions by Commissioner Wells that these recommendations would reduce the gross operating revenues of the company by a like amount, adding that they would be recouped by increased sales within a year. Cross-examination upon this point developed that here again Mr. Marshall was merely guessing. He had no data and no study to support his conclusions.

He called the rates proposed by him promotional rates, but admitted he had never had any experience concerning the effect of promotional rates in the telephone business and had drawn his conclusions concerning increased revenue from electric light and gas experience.

The telephone company contends that this line of testimony is entitled to no respect whatever in that it is a guess without foundation; and that the experience of gas and electric companies is no parallel for communication companies, due to the dissimilarity of the industries. The gas and electric companies sell a commodity as a one-way service by measurement of the quantities thereof; telephone companies sell a two-way service on demand.

Marshall Expense Exhibits Erroneous.

Gross errors in the Marshall expense exhibits were disclosed by the Whitney testimony. This showed that by good management operating expenses have gone down from $2.957 per station per month in 1926 to $2.712 in 1932. Property expenses increased only 6½ per cent from 1925 to 1932. The company has now better trained employes, better direction of company activities and takes less of the subscriber's dollar for operations.

Taxes, interest, dividends and depreciation, which constituted the property expenses, consumed 42.1 per cent of the revenue in 1926 and only 48.7 per cent in 1932. This increase in property expense was offset in part by a 3.8 per cent reduction in operating expense due to able management, the speaker stated.

Mr. Marshall dwelt extensively upon the fact that the company's messages per station, per mile of wire and per dollar of fixed capital had gone down. The Whitney testimony showed that these facts do not indicate inefficiency in plant but rather the company's success in meeting the demands of the public through increased plant for better service, and that an increase in plant was necessary to correct the evil of congestion which prevailed following the war. Mr. Marshall did not attempt to cross-examine Mr. Whitney on any point of the latter's testimony concerning company expenses.

General Conclusions on Utility Rates.

"In such times as the present," Mr. Grant stated, "we hear that our method of rate regulation is cumbersome because, under the constitutional provisions for the protection of property, it cannot give the relief to utility consumers to which a periodical dip in commodity price trends entitles them. The answer is that periodical and temporary dips in price trends do not in themselves entitle consumers to lower utility rates.

"During the past few months commodity prices have been steadily rising. The prediction of some of our national administrators is that they will go higher. What price levels should utility rates seek?

Should they proportion themselves to commodity prices of six months ago, to those of today, or those of six months hence? Manifestly, to attempt utility rate adjustments on such a fluctuating base as this would produce chaos and help no one."

The Interstate Commerce Commission said in its last annual report, relative to rate reductions: "It is of vital importance to avoid a degeneration into rate chaos and to proceed with caution and foresight rather than with panic."

As the price pendulum swings from side to side, utility rates should not and cannot follow. Manifestly, in periods of low commodity prices the process would be extremely unfair to the utility; and in periods of high commodity prices, the process would be very unfair to the users of the service. But it is claimed that since these conditions occur in industrial business they should follow sympathetically in the utility field.

That argument fails to take account of the fundamental difference between the dealer in commodities on the one hand and the utility on the other. As the Michigan commission so aptly phrased it in the Detroit Edison case: "It has been chiefly advocated by those who at some time or other would find it necessary to seek the suffrages of their fellow citizens."

FAITHFUL GUARDIAN OF H

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"THE HOUSE IS SAVED"

"Get help! My house is on fire!" These are the excited words that came to a telephone operator from a farmer near Gothenburg, Nebraska. In the space of minutes, his neighbors were on hand. Quickly they formed a bucket brigade and saved the home.

In time of urgent need, emergency, catastrophe, you turn to your telephone. Over its wires you send your voice to doctor, veterinarian, neighbor. You use it to reassure and comfort an absent member of the family, to shorten the hours of the day with a social call. It brings the latest market reports, takes a hand in many business transactions, keeps you in touch with the outside world.

Day in and day out, your telephone is on the job. Its helpful service is invaluable to you on the farm.

A BELL SYSTEM ADVERTISEMENT

THE FARM...

Telephone

n actual instance of telephone protection forms the basis for the dvertisement on the opposite page. It is one of a series appearing gularly in farm publications. Other advertisements suggest more very-day uses of the farm telephone—in getting up-to-the-minute arket reports, selling surplus produce, keeping up social contacts, c. Specific details and locations add interest and conviction.

Advertising of this character brings home to farm families e vital importance of having a telephone. It should help build ral business for telephone companies everywhere.

AN ADVERTISEMENT OF THE
AMERICAN TELEPHONE
AND TELEGRAPH COMPANY

When general price levels drop, the merchant sells out his stock at the current prices. He remains out of business for the time if he chooses, or he re-stocks at the current prices. If he has lost on the sale, he takes his loss and starts anew. When prices rise, he has goods which he has bought at low prices. He then sells at the new current prices and recoups the loss he sustained in the earlier reverse of that process.

The utility on the other hand, and particularly the telephone company, sells no commodity. It renders a service on demand. In doing so it uses a plant which it acquired at a period of fairly high prices. It cannot sell that plant but must keep it operating, with all the fixed charges which prevailed when that property went into service.

Looking at the question again from the user's standpoint: If the utility rates had followed the commodity price trend in 1927-9, utility rates would have risen above the level of a fair return on fair value in many instances. But, says the rate agitator, that could not have happened under regulation. He is right, said Mr. Grant, but if regulation prevents utility rates from following the commodity price pendulum in its upward swing, it ought not to compel utility rates to follow the pendulum in its downward swing.

He should remember that fairness to the utility means fairness to a great army of small investors, to thousands of men and women employes, and to the public which looks to the utilities for efficient service. Enforced rate reductions at this time mean more unemployment, the further loss of savings and an impairment of utility service.

Constitutional Rights Are Controlling.

Looking at the legal aspects of the situation, in all rate cases the constitutional rights of property must receive consideration as well as the rights of persons. This has always been true and is no less so today. It is true in times of depression as well as in periods of prosperity. State regulatory laws compel the utility to render adequate service to the entire community it professes to serve, regardless of prosperity or depression, and they limit the charges for such service; but at no time, under any circumstances, is there any lawful authority to compel the rendering of a public service at less than cost.

The courts have defined the "cost of rendering service" many times. It includes reasonable operating expenses, reasonable charges for depreciation, taxes, and a just compensation for the use of property. Provision for all these factors must appear in a reasonable rate for service. No authority exists to compel a utility to do more than to render adequate service at reasonable rates.

The public wishes more than anything else from the utilities the best possible service at the lowest practicable rates and under the forms of rate schedules adapted to public needs and uses. Mr. Marshall has suggested the establishment of measured service for all users, except the insignificant number of patrons located in the so-called agency offices located in very small communities. Mr. Whitney has pointed out very carefully and thoughtfully that the company's present schedules are calculated to adapt the service to the needs of various classes of users. The application of measured service for all would completely defeat one of the meritorious and necessary purposes of the present schedule.

Mr. Marshall has made the misleading statement, which is quite a frequent declaration of the uninformed—and occasionally the false argument of those who know better—that the state guarantees the utility the cost of rendering service as it has been defined. While the law limits rates to the cost, it holds absolutely no guarantee of the payment of those costs, any more than the law which limits interest rates to 6 per cent guarantees that a bank will earn its operating charges, taxes and dividends.

Concerning the guarantee of earnings, Commissioner Stone said at one hearing: "I don't think that the commissions have ever implied in any finding or decision that there is a guaranty of earnings."

Private capital invested in an unregulated industrial enterprise, with its freedom from regulatory statutes and as to prices for its product, can make large earnings and accumulate large surpluses during favorable periods. The utility, on the other hand, is limited by law. Private enterprise can shut down its factory when it wishes to do so. The utility must be ready to serve every day on the year and every hour in the day. This is a very potent reason why utility rates cannot keep pace with commodity prices in times of prosperity, and illustrates why no attempt should be made to compel them to keep pace in times of adversity.

Ability to Pay and Service Value.

During the recent period of extremely low prices, the contention has been that the reduced income of utility patrons has led to such a reduction in the value of utility service as to warrant a reduction in rates. This is the first time that the customers' ability to pay has been considered as an element in the determination of the value of service, and involves in reality a confusion of terms. The value of service may be greater during periods of inability on the part of the user to pay than at any other time.

The fact that a subscriber discontinues service because he cannot pay for it does not mean that its real value has become any less. Customers' judgment as to the value of the service is very apt to depend upon whether the utility is trying to collect its rates or the customer is trying to get money from the company for failure of service. In the vast majority of cases, the service is worth more than the amount charged for it. If it were not, the utility would soon cease to exist by virtue of economic law.

The professional agitator is joined just now by many honest but bewildered and desperate people seeking some way to reduce their expenses. No amount of persuasive argument can stay the desperate hand of the man who makes his living by preying on utility companies. The honest but bewildered householder and the business man, however, are amenable and responsive to an intelligent explanation of the utilities' plight. Upon thought they will admit that a straight horizontal cut of 25 cents per month in telephone rates, for example, would mean nothing; that $3 a year saved in this way would not add to their purchasing power.

Nevertheless, such a cut would spell disaster to the telephone company through a loss of over $3,000,000 a year in revenue, make necessary the dismissal of hundreds of employes, ruining the investment quality of the company's bonds, seriously affecting small investors and crippling an efficient and dependable public service.

The average man and woman can hardly be blamed for misinformation and hostility to public utilities when misstatements and worse are broadcasted by those who know better, in the hope that such appeals will assist them personally through political or professional channels. The average user of telephone service is more interested in the quality of service received than in the rate he pays for it.

A reduction of the present rates, which are producing revenue less than the cost of rendering service, should not be made at this time, said Mr. Grant. The present rates are not only failing to provide any surplus but also fail to provide the sum of operating expenses, fixed charges, reasonable depreciation and dividends which will attract new capital. Such a condition obviously cannot maintain the company's credit, and any cut in rates at this time, Mr. Grant said, would threaten the possibility of furnishing adequate telephone service to the public.

The commission should also give consideration to the fact that the company has signed a code pursuant to the National Recovery Act, which will materially increase its operating expenses. In conclusion, Mr. Grant urged the board to dismiss the complaint.

Time to Try Rate Experiment.

In his rebuttal argument, Mr. Marshall declared that it is time to try the experiment of a set of better rates than the company's. He claimed that the company is suffering from absentee management; denies that he would pettison all one-party line service; asserted that promotional

rates would restore lost revenue, and reiterated his contentions that the company has overbuilt its plant.

"Amend the Massachusetts savings bank law if necessary," said Mr. Marshall, "to allow such institutions to invest in bonds where utility stocks pay 5 per cent dividends instead of 6." He asserted that the company's plant congestion ended by 1925, and questioned why no banking experts had been called to testify as to the company's condition if it is so unfavorable. The speaker declared that "a competent local management needs no assistance like the Bell license contract, many of whose services are theoretical rather than practical," he said.

Mr. Marshall charged that the advertising program of the company was used to control newspaper opinion and news, saying that the rate case now approaching its end had been reported far more extensively outside than within Massachusetts. He denied that he proposed a service charge in his rate, but called it a minimum charge, and denounced the present extensive use of unlimited service as a bad habit.

Chairman Attwill asked whether the company's 50 years of experience with unlimited service has not been satisfactory. "It is difficult to say off-hand that such a form of rate is unreasonable, because you do not happen to like it," he commented.

In reply, Mr. Marshall said that the company is not developing an adequate service under its present form of rates and that tariffs should not be allowed to become either venerable or immortal. He asserted that an underlying resentment exists among the public over the present schedule. The hearing was then closed and the board took the case in hand for adjudication.

TELETYPE PRINTING TELEGRAPH SYSTEMS.

(*Concluded from page* 14.)

ment which permits the continuous feeding of the messages through the receiving machine which is under the control of the central sending operator.

Teletype equipment is used quite extensively by the railroads which require fast and reliable means of communication in order to safely and efficiently operate their systems. The more important services are:

General message traffic; switch lists between offices and switch towers in yards using mechanical retarders and switches; trace bureau information between yards and offices; transmission of consist reports, waybills and freight bills; train arrival and departure announcements in terminals; coach movement information regarding the make up of passenger trains.

What Operators Want to Know

Cleanliness Tends to Create Ideal Atmosphere in Exchange—Wrong Environment Reflects in Quality of Service and in Attitude of Employes Towards Company and Their Job—No. 129

By Mrs. Mayme Workman,
Traffic Supervisor, The Illinois Telephone Association, Springfield, Ill.

What a pleasing experience to visit an exchange which reflects proper training and environment! Operators sitting erect facing the switchboard, transmitters properly adjusted, no loud talking, busy tests being taken in the proper manner, and cords and plugs being handled carefully. The writer visited such an exchange recently, unexpectedly, and during a time when the chief operator was not on duty.

These ideal conditions do not "just happen." Undoubtedly it took a great deal of effort and perseverence to create this atmosphere. It was very noticeable that in this particular office the operators were surrounded by the proper environment; their quarters were clean and comfortable, the operating room was properly lighted and well ventilated, and the restroom was light and cheerful.

In a conversation with the chief operator's assistant she stated that a student operator remarked: "I just love this place. It is so clean and attractive it is a real pleasure to be here!"

This is as it should be inasmuch as environment reflects in the quality of the service rendered and in the attitude of the employes towards the company and towards their job.

In contrast to the office just described is the exchange where carelessness prevails; operators sitting in a slouchy position with chairs twisted to one side, headsets not properly adjusted, cords being jerked down and pushed into the jack with the palm of the hand, loud talking, inattention, and careless busy tests. When these conditions are found in an office you will usually also find dust, disorder, poor ventilation and untidiness. You are also very likely to find unsatisfactory service and dissatisfied employes.

What is the solution to this problem? Interest, cooperation and teamwork—words familiar to every telephone operator.

Ideal surroundings do not necessarily mean new and modern buildings, switchboard equipment, and elaborate restroom furniture. On the contrary, your equipment may be housed in an old building, it may not be of the newest and most modern type, your restroom furniture may be old-fashioned—and you may still have ideal

WHY WAIT?

You can't fix the roof when it's raining.

Neither can you install arresters during a lightning storm.

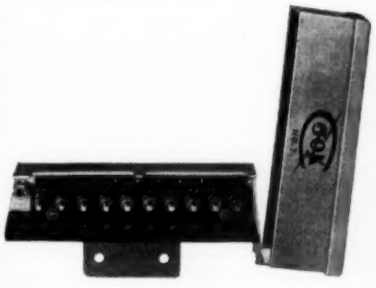
Cook No. 7 Lightning Arrester installed on open leads is a self-liquidating investment.

Prevents service interruptions.

Reduces maintenance.

Saves equipment.

Costs little to install.



COOK ELECTRIC CO.
2700 Southport Avenue
CHICAGO

surroundings if your quarters are kept clean and tidy, if your switchboard is kept in good repair, and your operating room is well-lighted and well-ventilated.

If the company and each employe will do their part there is no reason why every telephone exchange should not have ideal surroundings—clean, comfortable and attractive.

Questions from Illinois Operators.

1. If a subscriber places a long distance call to a personal party at an Independent station and the party has gone to a station we have to go Bell for and then we get a report that the party has left for the station tried first. We complete the call on the Independent line. Is the report charge over the Bell System line cancelled or not?
2. Do you announce a MX call to a tributary operator?
3. In placing a call, how long should you wait for a report?
4. Is a Class 1 office supposed to look up your routings when you do not have Long Lines route book?
5. Should you ring the toll center operator when subscriber is through talking or wait for her to come back on line?

For answers to these questions from real Illinois operators, please turn to page 32.

Provisions of Telephone Code Discussed at Conference Last Week.

Last week a conference was held in Washington, D. C., with representatives of the NRA by representatives of the Bell System group and F. B. MacKinnon, president, United States Independent Telephone Association, Chicago, representing the Independent group.

The proposal of the NRA of one code for the telephone industry was discussed at great length. The representatives of both the Bell and Independent groups held to the opinion that there should be a code for each group as the only feasible plan, because of differences in operating and other conditions which prevent the Independent companies from conforming to the Bell System's schedule of hours and wages.

Due to congestion in the NRA in an endeavor to complete various codes before the end of the year, it is probable that hearings on the telephone code will be postponed until early in 1934. This would probably involve an extension of the President's Reemployment Agreement, under modifications of which the telephone industry is operating and which expires December 31, by those telephone companies which have signed it.

Outside Plant Men Talk Things Over

It Was Two Years Ago That I Met You, Buddies.

By JAKE, THE LINEMAN.

Mornin', buddies! I am shure one happy ole man this mornin' an' as I look out over the crowd of you buddies who have dropped in on me for our regular Saturday mornin' lesson on safety, I jist want ter reach out an' shake hands with every one of you. It was two years ago that I first met you fellows an', believe me, durin' the time that has elapsed I've come ter look forward to these little chats with you.

For two years we have met down here in my ole office nearly every Saturday mornin' and between big chaws of terbaccer, I have tried to pass on to you safety rules that were designed to keep you away from Ole Man Accident; health rules and suggestions that I sorta hoped would keep you fellows well an' happy; and in addition we have also taken up and studied almost enuf first aid signals to qualify all of us for a doctor's degree.

And the tests we have had! Gee, I guess I've graded 'bout enuf test papers ter get a teacher's certificate in a gold frame. It was lots of fun findin' out how much we really knew about safety, wasn't it? Wa'll, I shure got a big kick out of it, and I hope that each one of you, who participated in our tests, enjoyed them.

Last nite I was readin' over some of my articles, and as I read them I just wondered if they did you fellows any good. If I succeeded in makin' you buddies look at your jobs in a different light—that is, to regard your job as your chance to make a success of life—I feel kinda happy. And if I have succeeded in making you realize the vital importance of practicing safety at all times, I feel more than happy.

After readin' a few of my first articles I turned to my file case an' as I rummaged through the letters I discovered that we had buddies in every section of this country, Canada, and even in far-away Porto Rico. It sorta made a thrill jump up and down my ole spine as I read some of the letters.

Some of them were letters of criticism and comment. Others came from buddies who were facing one of life's many problems, and turned to me for advice. Others described some tragic accident. One such letter ended with this statement: "Jake, tell the rest of the buddies about this accident but don't print my name. I don't want them to know I was dumb enough to have such an accident!"

I read each letter and as I read them I wondered what made them write. And then I ran across one which said: "I hope you'll pardon my telling you my troubles, but your articles are written in such a friendly tone that I knew you would understand." Well, buddies, I hope I can keep them that way for I like ter help folks solve their problems. If you've ever got anything on your chest that's troublin' you, drop me a line an' I'll do my derndest to help you.

I jist wonder how many of you old buddies are here today. There's C. C. Stone of Paris, Texas. Stone wrote me the first letter I received, commenting on my articles. How're things goin', Stone? An' over there in the corner sits J. H. Seaton, safety supervisor, Southwestern Bell Telephone Co., Dallas, Texas. Right down here in front is Ernie Hymus, Bell Telephone Co., of Canada, Toronto, Ont.

Thanks for the card from Europe, Ernie. Glad you had a good time! Over there at the right is E. M. Hunter, South Carolina Continental Telephone Co., Kingstree, S. C. How they goin', Hunter? Right behind him is standin' our ole pal, Walter Sheldon, Union Telephone Co., Edmore, Mich. Lookin' great, Sheldon. Drop us a line!

By cracky, thar's an old pal, Harley J. Barber, West Coast Telephone Co., Forest Grove, Ore. What do you know, Harley? Right beside him is Dermot K. Foley, San Francisco, Calif. Another old pal, Anthony Denning, German-American Telephone Co., Victoria, Kans. How they going, Denning? How many of you remember Frank Gray, Iowa Union Telephone Co., Emmetsburgh, Iowa? Frank won first place in our first test with a grade of 97. L. D. Styron, Durham Telephone Co., of Durham, N. C., also won recognition in that first test. Remember?

Guess that's about enuf names fer today, but I think we could keep going steady for a couple of hours yet. Now I want ter take time out an' thank every one of you for the support you have given me durin' our past two years together. I only hope that my future articles will warrant your staying with me and following the signals which will be published regularly in TELEPHONY.

May I have your frank criticism and comments from time to time, as we continue our fight against Ole Man Accident? If you think I'm missing something which should be pointed out, tell me about it. Let me know what you want covered and I'll do my best.

I have great plans for our department durin' the comin' issues and I hope to see all of my plans grow into the real thing. Together we can succeed, but without your kind support, I can only fail.

Let's keep on fightin' Ole Man Accident, buddies, until we force him to leave our

ranks alone. Study safety as you have never studied it before and watch the efficiency of your work improve.

Our motto from now on is "Keep On Keeping On" and we'll keep going until we win for:

Shunnin' never wins a fight,
An' frettin' never pays;
There ain't no good in broodin' on
The pessimistic ways.
Smile just kinder cheerfully
When hope is nearly gone,
An' bristle up, an' grit yer teeth
An' keep on keepin' on!

Guess I'll amble now. Thanks for droppin' aroun' fer our second birthday party. I'll be back soon and until then remember: "Safety pays and pays—accidents cost and cost!"

So long! Take care of yerselves. Drop me a line enny time.

"I Wonder Why" of an Observing, Traveling, Telephone Engineer.

By Ray Blain.

I wonder why in these times, when most telephone companies are exerting every effort to retain their subscribers and gain new ones, that some action is not taken to maintain telephones in vacant apartments so that when a new tenant moves in he will find an instrument working?

As most companies have the shelves of their storerooms filled with idle instruments, and all apartment houses are wired, this would not necessarily be any great additional expense.

In the old days it was common practice to leave telephones in vacant houses as well as apartments. Such stations were called "holdovers." They were generally connected to a special block of numbers and, when one called in, the operator would furnish local service and notify the chief operator who in turn would notify the commercial manager.

The prospective subscriber would be given service for a few days while getting settled and then solicited with a view of signing a contract. In most cases a new subscriber would be the result. Most people seem to appreciate this gratis service when they needed it the most and feel obligated to sign on the dotted line.

Early last summer I traveled to a mid-western city for a two-months' stay and rented a furnished apartment, in which I found a handset type telephone installed but not connected. I lived there two months but was never approached by a representative of the telephone company with a view of having it connected! Had this telephone been working when I moved in, and had a representative of the company called me and explained the rates and service, I would have signed a contract, although I neglected to visit the commercial office for that purpose.

Early this fall my work took me to another city for a period of three months, and I again rented a furnished apartment. Being a telephone man I immediately looked around for the telephone and found none, but there was a niche in the wall and the wiring was in place. I really needed a telephone in this location, but being very busy, neglected to contact the company whose nearest commercial office was several miles from my work.

After living there more than two months, a young chap called one night and explained that he was a representative of the telephone company and wanted to connect my telephone. As I had less than a month to remain in the city, I declined. Also by this time I had, in a way, become accustomed to doing without a telephone and didn't miss it quite as much as I did at first. Had this telephone been connected when I moved in, the company would have been aware of the fact and I would have paid it three months' rental.

Some may claim that telephones are often damaged by painters and cleaners when left in vacant apartments, but very little redecorating is being done in these times. When there is, the custodian can generally be relied upon to call the repair department if an instrument is in danger of injury. Anyway, a new subscriber is worth more than a few paint spots, a broken mouthpiece or a few damaged cords.

It appears more desirable to have telephones installed, if only acting as salesmen, than to have them piled on the storeroom shelf gathering dust. We have found it necessary to go back to the straightforward method of trunking and beer; and it might also be a good idea to go back to the old "holdover" method and gain a few new subscribers and hasten our general recovery throughout the country.

What the Commissions Are Doing

Up-to-the-Minute News Regarding the Activities of State and Interstate Commissions, Courts and City Councils in Matters Concerning Telephone Companies—Summary of Commission Orders and Schedule of Telephone Hearings

New Service Arrangement for Los Angeles and Territory.

At a resumed hearing in Los Angeles before the California Railroad Commission on December 7, the Southern California Telephone Co. through Vice-President and General Manager F. M. Rush accepted, in theory, the plan submitted by Ernest Watson, telephone engineer for the commission, at the hearing on November 28 for establishing a new telephone service arrangement in the Los Angeles metropolitan area. However, Mr. Rush asked for postponement pending a more predictable financial future. Details of Mr. Watson's plan were published on page 26 of the December 9 issue of Telephony.

Mr. Rush's statement was given out at the end of an all-day hearing on December 7 before Commissioner Whitsell. The hearing was continued to the following day, December 8, for final negotiations in the matter.

Mr. Rush, from the witness stand on December 7, admitted that the plan minimizes the importance of arbitrary boundaries and materially increases the scope of exchange service. At the same time he pointed out that it means a reduction in net company revenue of $380,000 a year; the expenditure of $475,000 to put the plan in operation, and that it makes necessary additional capital expenditures of $700,000.

Company revenues, Mr. Rush explained, have rapidly declined as a result of the depression until at the present time they are running at an annual rate of about $7,500,000 less than in 1930.

Under Mr. Watson's plan the Beverly Hills portion of the Los Angeles exchange would be established as a separate entity, having its own rate center. The South Pasadena area, now served both from Los Angeles and Pasadena, would become a part of the Pasadena exchange, a contingency on which City Attorney H. E. Vedder of South Pasadena looks considerably askance.

The Los Angeles exchange would be zoned instead of remaining a one rate center, and inter-exchange rates throughout the metropolitan area would be based on mileage measurements on a basis of five cents for each six miles.

The ultimate Los Angeles extended service area, as contemplated under this plan, includes Pasadena, Glendale, Alhambra, Montebello, Downey, Compton-Gardena, Hawthorne, Inglewood, Culver City, Beverly Hills, North Hollywood and the southern portion of Burbank.

In each of these exchanges extended area service classification would be available, the local calling area to include all stations on contiguous exchanges within a radius of six miles.

Surveys indicate that the subscriber interest is largely in these contiguous areas, and the plan will eliminate many inequitable rates now effective; in some instances a 10-cent toll being collected for a call across the street or around the corner.

The special merit of this type of circuit lies in the high test currents obtained by charging a condenser over part of a cycle to a high voltage and then momentarily short-circuiting the relatively high-resistance armature so that the current which flows out over the line is limited only

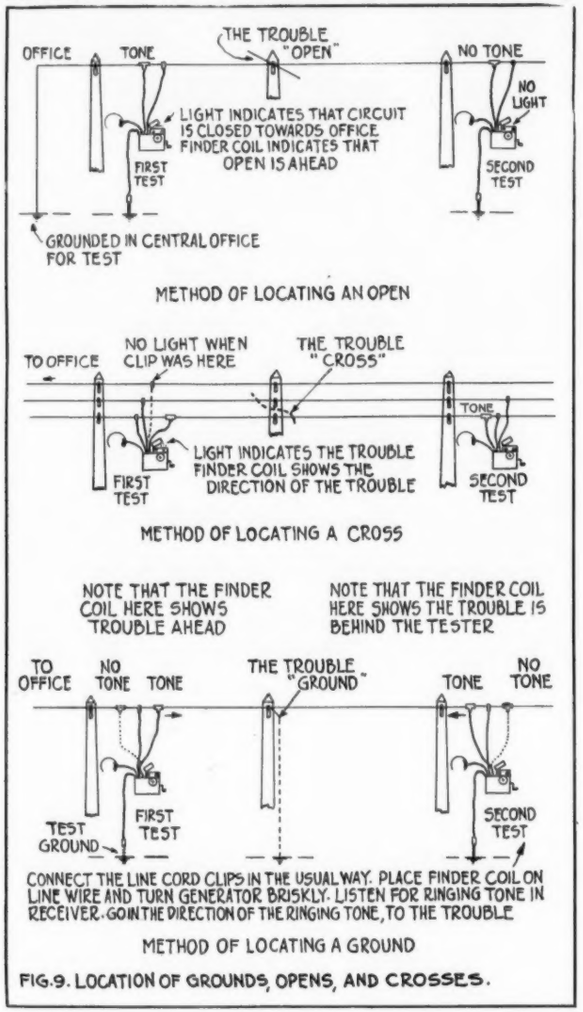

OFFICE
TONE
THE TROUBLE "OPEN"
NO TONE
LIGHT INDICATES THAT CIRCUIT IS CLOSED TOWARDS OFFICE. FINDER COIL INDICATES THAT OPEN IS AHEAD
NO LIGHT
FIRST TEST
SECOND TEST
GROUNDED IN CENTRAL OFFICE FOR TEST
METHOD OF LOCATING AN OPEN
TO OFFICE
NO LIGHT WHEN CLIP WAS HERE
THE TROUBLE "CROSS"
TONE
LIGHT INDICATES THE TROUBLE FINDER COIL SHOWS THE DIRECTION OF THE TROUBLE
FIRST TEST
SECOND TEST
METHOD OF LOCATING A CROSS
NOTE THAT THE FINDER COIL HERE SHOWS TROUBLE AHEAD
NOTE THAT THE FINDER COIL HERE SHOWS THE TROUBLE IS BEHIND THE TESTER
TO OFFICE
NO TONE
TONE
THE TROUBLE "GROUND"
TONE
NO TONE
TEST GROUND
FIRST TEST
SECOND TEST
CONNECT THE LINE CORD CLIPS IN THE USUAL WAY. PLACE FINDER COIL ON LINE WIRE AND TURN GENERATOR BRISKLY. LISTEN FOR RINGING TONE IN RECEIVER. GO IN THE DIRECTION OF THE RINGING TONE, TO THE TROUBLE
METHOD OF LOCATING A GROUND

FIG. 9. LOCATION OF GROUNDS, OPENS, AND CROSSES.

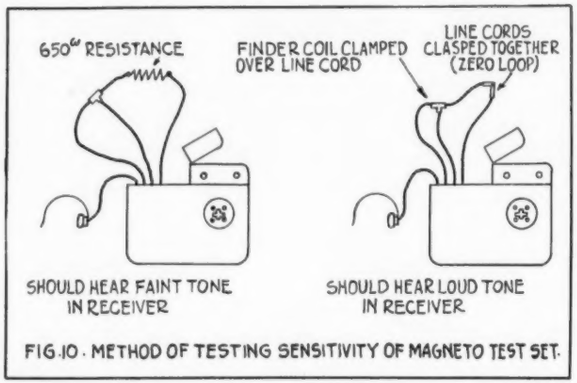

650Ω RESISTANCE
FINDER COIL CLAMPED OVER LINE CORD
LINE CORDS CLASPED TOGETHER (ZERO LOOP)
SHOULD HEAR FAINT TONE IN RECEIVER
SHOULD HEAR LOUD TONE IN RECEIVER

FIG. 10. METHOD OF TESTING SENSITIVITY OF MAGNETO TEST SET.

by the resistance of the fault itself and, of course, any equipment, such as telephone ringers or drops, which may be in shunt with the fault.

The method of locating grounds, crosses, etc., is the same as for short-circuits, the only difference being that in the case of grounds the one line clip is connected to ground and the other to the grounded wire, while in crosses the line clips are connected to the two crossed wires.

Fig. 9 illustrates the use of the inductive type test set.

The test set circuit shown in Fig. 6, it will be observed, is equipped with two keys. The *T* key serves to close the transmitter circuit and is depressed only when using the test set for communication purposes. The *L* key connects the 12-volt lamp in series with the generator for visual continuity testing purposes. The spring assembly marked *X* in the diagram, is operated automatically when the generator handle is turned. It serves to connect the finder coil in series with the receiver and to disconnect the telephone circuit from the line.

Inductive test sets of the type just described can be tested to see if they are operating as intended by connecting the line clips to a non-inductive resistance of 650 ohms and placing the finder coil over one of the wires as shown in Fig. 10. When the generator is operated, a faint tone should be heard in the receiver. The line clips are next short-circuited together as shown. Under this condition a loud tone should be heard when the generator is operated.

Use of Ohmmeter in Rural Line Testing.

As has been previously stated, an ohmmeter is a very useful adjunct to the rural troubleman's testing equipment. Its particular value lies in the fact that it will detect high-resistance faults which will not pass sufficient current to actuate the inductive fault-finder. It is also particularly useful in locating trouble that is traced to a particular telephone by the inductive fault-finder.

The ohmmeter is a direct-reading resistance meter, obtaining its measuring current from one or more small flashlight cells. The most useful types of ohmmeters are those having two ranges, thus permitting the measurement of both high and low resistances. The theory of the ohmmeter type of measuring instrument has been covered quite fully in past issues of Telephony (July 26, 1930; August 30, 1930).

In testing on the line the ohmmeter is chiefly useful when it is possible to open the circuit which has the fault on it. If this is done, the magnitude of the ohmmeter reading will generally indicate the direction in which the fault lies. It must be remembered, in testing on the line with an ohmmeter, that the meter reads only the direct current resistance in shunt with its terminals. Hence faults, such as condensers connected across the line, low impedance ringers, etc., will not be picked up using an ohmmeter. For making a quick check of the operating condition of a magneto telephone, the ohmmeter has no equal.

The procedure in making a test on a magneto telephone is to connect the ohmmeter across the line terminals after one side has been disconnected. The ohmmeter should then read the resistance of the ringer (assume no condenser in series). If a resistance reading considerably below that of the ringers is obtained, it indicates that a fault exists in the set. If there is no condenser in the receiver circuit, a low reading may be caused by the switchhook failing to disconnect the receiver from the line when it is on the hook.

Failure of the generator shunt spring to remove the generator from the line when the handle is in a non-operated position, is also a cause of a low reading. Carbonized insulation in generator shunt springs, or in the receiver switchhook, will often result in a low reading. If the reading is considerably higher than the known or measured resistance of the ringer, a high-resistance connection between the line posts of the telephone and the ringer is indicated.

Trouble of this type, or of the type previously mentioned, is most readily located by placing the ohmmeter in a position where it can readily be observed. Then by running the finger over the wiring, switchhook, generator springs, the needle of the ohmmeter will generally be observed to fluctuate when the part in trouble is moved slightly.

If the telephone checks O. K. with the receiver on the hook, it should be removed and the reading noted. If a non-ring-through condenser is in series with the receiver the reading will not change when the receiver is off the hook unless the condenser is short-circuited. The ohmmeter with the receiver off the hook should read approximately 90 to 100 ohms. Any wide deviation from this value should be viewed with suspicion.

After checking the receiver circuit, replace the receiver on the hook, and test the operation of the generator shunt spring by slowly turning the generator handle in and out. When the handle is in, the armature of the generator should lower the resistance reading to 200-300 ohms.

The plan is declared to be a practicable application of the zoning system to a great public utility, and its technical workability, outside of the cost element, was admitted by H. W. Hitchcock, chief engineer of the telephone company, and T. J. Harris, general commercial engineer, specializing in rate building.

Eugene Mitchel, representing the Los Angeles Retail Merchants' Association and other organizations, protested against any change or interruption in the further decentralization or material expense increase to retail interests in the downtown section resulting from the contemplated erection of new rate structure which might in turn reduce sales now consummated by telephonic communication.

Mr. Watson explained that Los Angeles subscribers, except those in the downtown business district, would have available, without additional cost, many sections now within the 10-cent toll area while subscribers in exchanges contiguous to Los Angeles would have the option of continuing under the present rate, or subscribing to the proposed extended service.

Between suburban exchanges and Los Angeles there would be, in general, a five-cent reduction over the most extensively-used routes. Over less busy lines there would be, in some instances, an increase of five cents. Under the extended service principle all toll rates into adjacent areas would be eliminated up to six miles.

An example is cited in the Los Angeles-Long Beach rate, where approximately 26,000 messages a month would be reduced five cents and only 4,000 messages increased five cents.

In the San Fernando area the decrease and increase ratio would be about ten to one. The net effect of the recentering in Los Angeles would be in excess of three messages reduced five cents for each one correspondingly increased.

Depreciation Accounting Order

Nebraska State Railway Commission Approves Uniform Accounting Practices of Interstate Commerce Commission But Reserves Right to Enter Final Order Fixing Depreciation Rates

The Nebraska State Railway Commission has adopted a finding and order with respect to depreciation accounting and charges to the extent that it will use the data accumulated by the Interstate Commerce Commission and cooperate with it in securing whatever additional data is desired, but serves notice that it will make its own depreciation rates when the time comes for final analysis and action.

It takes this position on the theory that Congress never intended to give the Interstate Commerce Commission power to make depreciation rates applicable to the telephone property within the states because this carries with it inevitably an interference with the service rate-making powers of the states. It says that what Congress has done so far in ordering the Interstate Commerce Commission to secure depreciation figures has been in the interest of uniform accounting only.

Compromising a part of their differences and leaving until later the final determination of the remainder, the commission issued an order to all Class A and Class B telephone companies that they file with the commission not later than March 1, 1934, a schedule of depreciation rates by primary accounts, which they propose to apply for the year 1934, together with such supporting data as is required by the Interstate Commerce Commission in schedules 1 and 2, attached to Circular 7, depreciation section series.

All Class A companies are required to file with the Nebraska commission not later than August 1, 1934, their composite annual percentage rates to be effective January 1, 1935, and in accordance with paragraph 8 of the order in Docket No. 14,700, and all supplemental orders that have been or may be entered thereon. All Class B companies are to make similar filings not later than August 1, 1935, including composite annual percentage rates to be effective January 1, 1936.

The procedure adopted by the Interstate Commerce Commission for prescribing depreciation rates is approved by the Nebraska commission except that it reserves the right to review the findings and conclusions of the Interstate Commerce Commission and enter a final order thereon as to the depreciation rate for accounting purposes to it.

The effect of the order is to supply and use all data gathered by the two commissions, but if the rate finally fixed by the Interstate Commerce Commission is higher than the state commission thinks is proper, it will fix a lower rate. This postpones for several years any final order by the state commission, at which time the telephone companies will naturally insist upon following the rates fixed by the Interstate Commerce Commission. This will, in turn, make it necessary for the state commission to justify a lower rate upon the same data.

Commissioner Bollen, who wrote the order just issued, included in it a history of the interstate commerce act and its application to telephone rates. That act provides that it should not apply to the transmission of intelligence by wire or wireless within one state and not transmitted to or from a foreign country from or to any place in the United States. Section 20 gave the Interstate Commerce Commission power to require annual reports and to prescribe a uniform system of accounts for Class A and Class B companies.

While in its first issue the commission order made depreciation accounting necessary, it did not undertake to prescribe the rates. It did, however, direct that the rate should be fixed so as to distribute, as nearly as may be, evenly throughout the life of the depreciating property, the burden of repairs and the cost of capital consumed in operations during a given month or year, and should be based upon the average life of the units comprising the respective classes of property.

In 1920 the act was amended so as to give the commission wider powers, including authority to prescribe the depreciable classes of property and the percentage to be charged with respect to each. Under this amendment the depreciation section of the commission was created, and on March 10, 1923, it submitted its report. Hearings started on May 1, 1923, and continued intermittently until October 22, 1928. On July 28, 1931, a final report and order was made and entered. Depreciation accounting as prescribed therein became effective January 1, 1933.

In connection with the final order, certain returns were to be filed with the state commissions by the two higher class companies for assistance in prescribing the composite annual percentage rates. The

Concealed bottless guy wire retainer
1" Slot opening
2¼" Slot opening to accommodate Guy Clamp
Guard attached to Guy Clamp

Specify

"STAZ-RITE" GUY GUARDS

The Guards that Fit Into YOUR Plans for Economy.

This 1-piece, galvanized guard appeals especially to Utilities interested in the broader phase of economy in guard installation. The "STAZ-RITE" is designed to meet today's requirements. Installed in 1 minute—100% salvageable.

UTILITIES SERVICE CO., INC.

Mfrs. of Galvanized Pole Line Hardware

ALLENTOWN, PENNA.

Write for "Pole Line News", our new bulletin containing complete installation information.

When the handle is in, the armature of the generator should lower the resistance reading to 200-300 ohms.

useful in locating trouble that is traced to a particular telephone by the inductive fault-finder.

FIG. 9. LOCATION OF GROUNDS, OPENS, AND CROSSES.

dates for such filings were several times postponed, and at present they are those fixed by the Nebraska commission.

In this respect the order merely directs the telephone companies to do as the Interstate Commerce Commission had previously prescribed. The state commission has never considered or attempted to fix depreciation rates for A and B companies, save where involved in a pending rate case, but now takes the position that it is imperative for it to consider the question.

In his discussion of jurisdiction, Commissioner Bollen says that the Interstate Commerce Commission should receive the highest commendation from all state commissions for the progress already made: that this commission has no objection if the law of Congress merely intends to authorize the Interstate Commerce Commission to fix depreciation rates for the purpose of uniform accounting to it, but that it should and must object if Congress intended to authorize the federal commission to fix rates for the purpose of accounting to state regulatory bodies.

The amount allowed in operating expenses for accrued depreciation is a factor in determining the rates for telephone service, and cases will arise where an excess of 1 per cent allowed for depreciation will amount to an excess of 1 per cent over a reasonable return. Congress, he says, has not delegated to the federal commission power to fix rates for any telephone company, whereas the state commission derives directly from the state constitution such power.

Mr. Bollen says that the state commission has not set up any accounting system for Class A and B companies, but has allowed such companies to file with it a copy of their reports to the Interstate Commerce Commission. Up to this point, it was clearly the intention of Congress to establish uniformity in accounting and reporting to aid state commissions in their regulatory powers and to be used by the state commissions if they so desired.

"In view of the fact that nearly all telephone service is intrastate and the further fact that the state commissions have regulatory powers to fix reasonable rates for service, it is our opinion," says the state commission, "and we so find, that Congress did not intend to authorize the Interstate Commerce Commission to prescribe depreciation rates, except for the sole purpose of establishing uniformity on depreciation accounting to the Interstate Commerce Commission, and for the purpose of aiding the state commissions in fixing a depreciation rate.

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Answers to the Traffic Questions Presented on Page 28.

1. The report charge over the Bell company's line is cancelled.
2. Yes.
3. A report is due 10 minutes from the filing time.
4. Yes.
5. It is the toll center's responsibility to supervise the connection at intervals of approximately one minute during the initial period and at frequent intervals (at least every 15 seconds) thereafter. Therefore it should not be necessary for the tributary operator to ring when the subscriber is through talking.

"In other words, the Interstate Commerce Commission has the final word on depreciation accounting for the purpose of a uniform system of accounting to the Interstate Commerce Commission, and the state commissions have the final word in fixing depreciation percentages, so far as accounting and reporting systems are concerned. It is clearly not the intention of Congress to deprive the state commissions of their regulatory power to fix reasonable rates."

The commission says that Congress has supplied the federal commission with enough money to employ a staff no state commission could afford, and that the principles enunciated in the master study of depreciation accounts so far made should be adopted by this commission. It will, therefore, avail itself of the studies and progress made by the federal commission, and will cooperate with it to the end that the amount representing reserve for accrued depreciation may reflect, as nearly as possible, the actual depreciation of the combined classes of depreciable property.

Commission Contends for Lower Return at Injunction Hearing.

Attorneys for the Georgia Public Service Commission contend that the Southern Bell Telephone & Telegraph Co., under present conditions, should be allowed only a 5½ per cent return on its investments in Georgia instead of the 8 per cent it deems is fair and reasonable.

The contention was made on December 11 before a three-judge federal court which held a hearing on the petition of the telephone company seeking a permanent restraining order against the 25 per cent rate cut ordered by the commission, effective December 1 in Georgia.

Attorneys for the telephone company argued that a 25 per cent reduction would mean confiscation of property in violation of the federal constitution. The commission contends there are no constitutional questions involved in the matter.

While representatives for the telephone company estimated the value of telephone exchange property in Georgia at approximately $27,000,000, the commission declares the value should be placed at approximately $18,000,000.

John T. Goree, assistant attorney general and leader of the attorneys for the commission, argued that the financial condition of the telephone company would permit it to participate in the President's recovery program better than many other businesses which had been affected by adverse business conditions. He declared the company paid consistently to its stockholders an annual dividend of 8 per cent, which had only been reduced to 6 per cent during 1933.

The company now has, Mr. Goree said, in its surplus a large sum and has accumulated an accrued depreciation reserve of approximately 20 per cent. It has been able to finance itself at approximately 5.88 per cent and occupies a more advantageous position than other businesses.

Figures were produced by the commission indicating that the Southern Bell company paid $119,000 in 1932, or 1½ per cent of its gross income to the American Telephone & Telegraph Co., under a license contract. It was contended that this fee is in excess of the services rendered.

Attorneys for the telephone company declared that the reduced rates would cut its revenue by approximately $650,000 annually in Georgia. They spent much time in reviewing figures presented at the federal court hearing in Gainesville, Ga., on December 1, showing what would be its loss on the various classes of service.

Summary of Commission Rulings and Schedule of Hearings.

FLORIDA.

November 25: Order issued authorizing the Southern Bell Telephone & Telegraph Co. to extend its base rate area at Palm Beach, Fla., one mile in each direction. The commission said the extension would result in reduction of approximately $1,500 annually in the cost of telephone service to subscribers in the area.

ILLINOIS.

December 14: Hearing in Chicago on complaint of the city of Champaign against the Illinois Bell Telephone Co. asking a reduction in existing rates in Champaign. Hearing held in order to hear oral argument on motion of complainant that respondent furnish certain information, and that appraisal be made by the commission, etc.

NORTH CAROLINA.

November 29: Hearing in Raleigh to accept testimony of the Southern Bell Telephone & Telegraph Co., which is vigorously opposing a petition of the city of Goldsboro that telephone rates be reduced.

Fred J. Turner presented figures to show that his company only earned 2.42 per cent on its investment of $238,188 at Goldsboro in 1932 but his report for eight months of this year showed earnings of 5.18 per cent.

UTAH.

January 8: Hearing resumed in statewide rate investigation of the Mountain States Telephone & Telegraph Co., instituted on commission's own motion following filing of complaint by Logan subscribers charging a discrimination in rates.